Adaptation to Climate Change through Disaster Risk Reduction in Bangladesh: Community Engagement in Local Level Intervention

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Adaptation to Climate Change through Disaster Risk Reduction in Bangladesh: Community Engagement in Local Level Intervention

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ABSTRACT

A common platform for both disaster risk reduction (DRR) and climate change adaptation (CCA) has been sought around the world to reduce human vulnerability, enhance adaptive capacity and achieve other contemporary global targets. This policy framework at global and national level creates a challenge for local level implementation: climate change is a global risk predicted by scientists whereas disaster vulnerability is experienced by local people. To consider these circumstances, the thesis examines how DRR and CCA can be integrated at local level and what kind of governance and institutions are needed to ensure community participation in the whole process of local development. In order to address the research question, the thesis focuses on four inter-related themes: (i) redefining social vulnerability in a changing environment; (ii) understanding local knowledge, experiences and practices in terms of coping with climate induced disasters; (iii) investigating the DRR and CCA conundrum of implementing national policies at local level; and (iv) exploring the transformation of socio-cultural landscape of rural Bangladesh through external interventions at local level in a DRR–CCA context.

The study has gone through an in-depth empirical data analysis of DRR and CCA processes both in flood prone Jamuna river basin and cyclone prone coastal areas in Bangladesh. Fieldwork involved qualitative approaches and methods, and some use of quantitative survey method; including 29 semi-structured in-depth interviews, varied participatory rural appraisal (PRA) tools applied in nine focus group discussions (FGDs) and a questionnaire survey conducted in three selected study villages. Respondents included local people, particularly disaster survivors, local level practitioners, national level professionals formally linked to disaster and climate issues and academics.

The findings of the thesis show that local knowledge and practice, particularly through recent experiences of environmental crisis help communities to adapt to climate related disaster risks and that the survivors of floods have more distinct coping and adaptive capacity than those of cyclones. The research found that disaster management in Bangladesh is strong up to local level and that recent government and nongovernmental initiatives for DRR and CCA assist communities coping with extreme events. However, the whole system often fails to identify and understand localised disaster and climatic risks due to a lack of effective community inclusiveness in decision-making processes. The study argues that a ‘whole-of-society’ approach should be a pervasive aspect of internal and external interventions aiming to implement more integrated DRR–CCA at local level.

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List of abbreviations and acronyms

AD	*Anno Domini* (advancing age)
ADB	Asian Development Bank
ADP	Annual Development Programme (Bangladesh)
AfDB	African Development Bank
AUSAID	Australian Agency for International Development
BARD	Bangladesh Academy for Rural Development
BBC	British Broadcasting Corporation
BBS	Bangladesh Bureau of Statistics
BC	before Christ
BCAS	Bangladesh Centre for Advanced Studies
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCT	Bangladesh Climate Change Trust
BCCTF	Bangladesh Climate Change Trust Fund
BDRCS	Bangladesh Red Crescent Society
BDT	Bangladeshi taka
BRAC	Bangladesh Rural Advancement Committee (former)
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
CARE	Cooperative for American Remittances to Europe (former)
CBA	Community based adaptation
CBDRM	Community based disaster risk management
CBDRR	Community based disaster risk reduction
CBO	Community based organisation
CCA	Climate change adaptation
CCC	Climate Change Cell (Bangladesh)

CCCSRU	Center for Climate Change Study and Resource Utilization (University of Dhaka, Bangladesh)
CCDMC	City Corporation Disaster Management Committee (Bangladesh)
CDMP	Comprehensive Disaster Management Programme (Bangladesh)
CEGIS	Centre for Environment and Geographic Information Services (Bangladesh)
CLP	Chars Livelihoods Programme (Bangladesh)
CO_2	Carbon dioxide
CPP	Cyclone Preparedness Programme (Bangladesh)
CRA	Community Risk Assessment
DANIDA	Danish International Development Agency
DC	Deputy Commissioner (Bangladesh)
DDM	Department of Disaster Management (Bangladesh)
DDMC	District Disaster Management Committee (Bangladesh)
DFID	Department for International Development (UK)
DM	Disaster management
DMB	Disaster Management Bureau (Bangladesh)
DMCs	Disaster management committees
DoE	Department of Environment (Bangladesh)
DRR	Disaster risk reduction
DRTMC	Disaster Research Training and Management Centre (University of Dhaka, Bangladesh)
EC	European Commission
e.g.	*exempli gratia* (for example)
EGPP	Employment Generation Program for the Hardcore Poor (Bangladesh)
ERD	Economic Relations Division (Ministry of Finance, Government of Bangladesh)
et al.	*et alia* (and others)
EWS	Early warning system

FAO	Food and Agriculture Organization of the United Nations
FAP	Flood Action Plan (Bangladesh)
FCDI	Flood Control, Drainage and Irrigation Projects (Bangladesh)
FEMA	Federal Emergency Management Agency (USA)
FFW	Food for Work Programme (Bangladesh)
FFWC	Flood Forecasting and Warning Centre (Bangladesh)
FGD	Focus group discussion
FPCO	Flood Plain Coordination Organization (Bangladesh)
GBM	Ganges-Brahmaputra-Meghna catchment area
GHG	Green house gas
GoB	Government of Bangladesh
HFA	Hyogo Framework for Action 2005–2015
HYV	High yielding varieties
Ibid.	*Ibidem* (in the same place)
IDMC	Internal Displacement Monitoring Centre (Norway)
i.e.	*id est* (it is)
IES	Institute of Environmental Science (University of Rajshahi, Bangladesh)
IFAD	International Fund for Agricultural Development
IFRC	International Federation of Red Cross and Red Crescent Societies
INGO	International nongovernment organisation
IPCC	Intergovernmental Panel on Climate Change
ISPAN	Irrigation Support Project for Asia and Near East
IUBAT	International University of Business Agriculture and Technology (Bangladesh)
JICA	Japan International Cooperation Agency
JIDPUS	Japan Institute of Disaster Prevention and Urban Safety (BUET, Bangladesh)

LDRRF	Local Disaster Risk Reduction Fund
LG	Local government
LLDRM	Local level disaster risk management
MDGs	Millennium Development Goals
MoCHTA	Ministry of Chittagong Hill Tracts Affairs (Bangladesh)
MoDMR	Ministry of Disaster Management and Relief (Bangladesh)
MoEF	Ministry of Environment and Forests (Bangladesh)
MoLGRD&C	Ministry of Local Government, Rural Development and Cooperatives (Bangladesh)
MoPA	Ministry of Public Administration (Bangladesh)
MP	Member of Parliament
MPhil	Master of Philosophy
MS Excel	Microsoft Excel
MSc	Master of Science
NAPA	National Adaptation Programmes of Action
NGO	Nongovernment organisation
PA	Participatory appraisal
PAR	Pressure and Release Model
PGD	Postgraduate Diploma
PGDDM	Postgraduate Diploma in Disaster Management
PhD	Doctor of Philosophy
PIO	Project Implementation Officer (Bangladesh)
PKSF	*Palli Karma-Sahayak* Foundation (Rural Employment Generation Foundation, Bangladesh)
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal Participatory Reflection and Action
PSF	Pond sand filter

RDA	Rural Development Academy (Bangladesh)
RRA	Rapid Rural Appraisal
RRAP	Risk Reduction Action Plan
SADMC	South Asian Disaster Management Center (Bangladesh)
SOD	Standing Orders on Disaster (Bangladesh)
SREX	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
TR	Test Relief (Bangladesh)
TTDC	Thana Training and Development Centre (Bangladesh)
TV	Television
UDMC	Union Disaster Management Committee (Bangladesh)
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-HABITAT	United Nations Human Settlements Programme
UNICEF	United Nations Children's Fund
UNISDR	The United Nations Office for Disaster Risk Reduction
UNO	*Upazila Nirbahi* Officer (Sub-district Executive Officer, Bangladesh)
UP	Union *Parishad* (Union Council, Bangladesh)
US$	US dollar
USAID	U.S. Agency for International Development
UzDMC	Upazila Disaster Management Committee (Bangladesh)
UzP	*Upazila Parishad* (Sub-district Council, Bangladesh)
VDP	Village Defence Party (Bangladesh)
VGF	Vulnerable Group Feeding (Bangladesh)
WARPO	Water Resources Planning Organization (Bangladesh)
WB	World Bank
WHO	World Health Organization

List of Bangla terms

Agrahayan	The eighth month of Bangla calendar (mid-November to mid-December)
Akal	Extreme scarcity
Aswin	The sixth month of Bangla calendar (mid-September to mid-October)
Aush	A season of rice cultivation (summer)
Auvab	Scarcity
Boro	A season of rice cultivation (winter)
Char	A low lying land, form by the accretion of sediment in river deltas
Chira	Flattened rice
Chitmahal	Enclave or exclave
Choira	A char-dweller
Chor	Thief
Dingi	A small country boat
Dwip	Island
Foria	Middleman, particularly in marketing channel
Gom	Wheat
Haor	A bowl or saucer shaped shallow depression usually situated in the Northeast region of Bangladesh
Karma	Employment
Karmasuchi	Programme or schedule
Kartik	The seventh month of Bangla calendar (mid-October to mid-November)
Kawn	A local variety of millet
Khal	Canal
Kharif	Summer crop season
Khas	State owned land

Manush	People
Monga	Seasonal scarcity of jobs
Mora Kartik	Deadly Kartik
Muri	Puffed rice
Nagorik	Citizen
Nirbahi	Executive
Nobanno	Bengali festival of crop harvest during September-October
Nodi	River
Palli	Rural
Parishad	Council
Pourashava	Municipality
Purdah	Privacy
Rabi	Dry or winter season
Shari	A traditional dress of South Asian women that typically wrapped around the waist with one end draped over the shoulder baring the midriff
Shouhardo	Friendship
Somoi	Time
Sukh	Happiness
Thana	Police station
Unnayan	Development
Upazila	Sub-district
Vanga	erosion
Zaminder	Local landlord during the colonial era
Zila	District

Dedication

To my Abba (father), my light, my guide, my inspiration, my hero, my great love passed away. He was one of a kind.

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Author's declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the University Ethics Committee in May 2011.

The total word count for this thesis is 81,759 words.

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Chapter One

Introduction

CHAPTER ONE

Introduction

1.1 Background of the study

Environmental disaster risk is considered to be highest amongst the poor of the developing world (Dilley et al., 2005; UNISDR, 2009a), the consequential losses being a major obstacle to development (UN, 2000; Collins, 2009). Climate change can influence disaster risks in two ways, firstly through increases in weather and climate hazards, and secondly through increases in the vulnerability of communities, particularly where people are economically poor and exposed to natural hazards (Blakie et al., 1994; Wisner et al., 2004; Viner and Bouwer, 2006; O'Brien et al., 2008; Davies et al., 2009; UNISDR, 2009a; IPCC, 2012, 2014; Béné et al., 2014). Apart from projected extreme climatic events of the future, many changes are already being observed indicating adverse impacts on both natural and human systems (IPCC, 2007, 2012, 2014; UNISDR, 2008a, 2009b, 2013).

The research presented in this thesis has taken place during a period of increasing trends of environmental disasters. The interpretation of their threatening impacts on lives and assets has resulted in a paradigm shift in the disaster management knowledge base in many countries round the world - from short term relief and response to holistic management of all phases of the disaster cycle (Hewitt, 1997; Coppola, 2006; Gaillard, 2007). A current emphasis is clearly on disaster risk reduction (DRR) – preparedness, mitigation and prevention for reducing hazards, vulnerability and unfolding disaster impacts (Davies et al., 2009; UNISDR, 2013). UNISDR (2009b: 10-11) defines DRR as:

> "The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events."

Meanwhile there are two well established approaches to deal with climate change – 'mitigation' meaning reducing carbon emission to such levels which will be safe for future generations and 'adaptation' meaning the processes or adjustments that people make to reduce their present vulnerability to climate risks (Burton et al. 1993; Smit,

1993; Watson et al., 1996; Burton, 1997; Smith, 1997; Smithers and Smit, 1997; Smit et al., 2000; Olmos, 2001; Shaw et al., 2007; IPCC, 2012, 2014). The IPCC (2014: 118) defines adaptation as:

> "[is the] adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects."

Recent analyses have explored the conceptual and practical similarities and differences between DRR and CCA (O'Brien et al. 2006a; Schipper and Pelling, 2006; Thomalla et al., 2006; Mitchell and van Aalst, 2008; Venton and La Trobe, 2008; Birkmann and von Teichman, 2009, 2010; Schipper, 2009; Mercer, 2010). Apart from having few political and thematic differences in approach, these studies advocate the many similarities between the concepts of DRR and CCA. This has suggested a call for a common platform for using both DRR and CCA to reduce disaster risks and adapt to climate change (Glantz, 2003; Sperling and Szekely, 2005; Few et al., 2006; O'Brien et al. 2006a; Lewis, 2007; Christoplos et al., 2009; Warner, et. al., 2009; Mitchell et al., 2010). The underlying rationale is that both DRR and CCA converge many common agendas across vertical spatial scales[1] (from global to local and community) in the context of risk management, vulnerability reduction, community resilience and wider sustainable development (see Chapter 2 for details).

At the international policy level, the Hyogo Framework for Action 2005–2015 (HFA) as well as the Sendai Framework for Disaster Risk Reduction 2015–2030 is addressing, though policy, the risks associated with existing climate variability and future climate change within the strategies for reducing disaster risks (UNISDR, 2014; Kelman, 2015; UN, 2015). Meanwhile, climate induced extreme events and DRR was first prominently paid attention to by the United Nations Framework Convention on Climate Change (UNFCCC) in the Bali Plan of Action (UNFCCC, 2008), and more recently in the SREX Report and the Fifth Assessment Report of IPCC (IPCC, 2012, 2014).

While the governments of many developing countries agreed to integrate DRR and CCA into the mainstream of their development process, both components have not been well coordinated in relation to institutional arrangements, policy formulations

[1] Birkmann and von Teichman (2010) for further reading

and project implementation (Mitchell et al., 2010). Gero et al. (2011) argue that there is no difference between DRR and CCA at the community level due to their dependency on nature-based lives and livelihoods, which can contribute to community- based DRR and CCA initiatives. Local communities have their inherited knowledge and experiences for coping with seasonal variability and extreme climatic events (Brokensha et al., 1980; Schmuck-Widmann, 1996; Kelman et al., 2009; Nunn, 2009).

Though disaster impacts are often acutely observed at community level, information about climate change and its effects at local scale are generally unavailable such that this presents a vital challenge for all stakeholders to integrate DRR and CCA at the local level (IPCC, 2012). It is however far from detailed as to how this operates as risk reduction and adaptation in a regular way, and how this is then affected by the changing paradigms that bear down upon varied institutional arrangements of DRR and CCA emerging more widely. The thesis addresses a likely emergent disconnect between wider discourse and local level realities in this field.

1.2 Geographical focus of the study

Bangladesh is one of the most vulnerable countries in the world to both disasters and climate change. Floods, tropical cyclones, coastal and river bank erosion, earthquakes, droughts, landslides, tornadoes, tsunamis, water logging and salinity are the major hazards of Bangladesh (CDMP, 2008; DDM/GoB, 2015). It was predicted that changes in climate trends, variability and extreme events in Bangladesh including increasing average temperature, annual mean rainfall, severe floods, intensity of cyclones, frequency of monsoon depressions, salinity on the estuaries and water shortages (Mahtab, 1989; Ahmed and Alam, 1998; Ali, 1999; FAO, 2007; IPCC, 2007). These have already been observed in Bangladesh (Ahmed and Alam, 1998; Islam and Ahmed, 2004; Islam, 2007). Furthermore, it is predicted that, by 2050, the country could lose nearly one-fourth of its land and more than three million coastal people would be displaced due to the present rate of sea level rise (Ericson et al., 2005).

Given this future scenario it is important to consider that the country has a good history of disaster management and recently started to take climate change into account. Most development projects in the country address reducing vulnerability to

disasters or poverty, and it is well recorded how local people have their own well established coping capacities (Alam and Collins, 2010). The Government of Bangladesh (GoB) has invested around US$10 billion for adjusting to climatic events over the last 35 years (Asian Foundation, 2012). The country has a government department for disaster management since 2012 under the Ministry of Disaster Management and Relief following the ratification of the Disaster Management Act 2012 (DDM/GoB, 2015). Besides, the Cyclone Preparedness Programme (CPP), a government programme under the same ministry supported by Bangladesh Red Crescent Society (BDRCS), is considered a model for the rest of the world for disseminating early warning at community level and rescuing of vulnerable people to cyclone shelters by volunteers (IFRC, 2014). The Comprehensive Disaster Management Programme (CDMP) was implemented during 2004-2015 jointly by the government and several development partners led by UNDP. These organisations and programmes present a bold step in materialising the commitment to strengthen the capacities of the government in reducing disaster risks, particularly for the most vulnerable areas (MoDMR/GoB, 2015).

A National Disaster Management Policy has been formulated to define the national perspective on disaster risk reduction and emergency management, and to describe the strategic framework, and national principles of disaster management in Bangladesh. In addition, the National Plan for Disaster Management (2010–2015) was approved by the National Disaster Management Council. It was prepared with the aim to reduce the vulnerability of the poor to environmental and human-induced disasters to a manageable and acceptable level. The Government introduced a fund called the "National Disaster Response and Recovery Fund" for response, relief and recovery through its own resources and donations from home and abroad, and recently initiated another fund called the "National Risk Reduction Fund" for projects which are designed for the purpose of prevention, mitigation and preparedness (ibid.).

To streamline activities of GoB towards facilitating adaptation to climate change, the Climate Change Cell (CCC) was established in 2004 in the Department of Environment (DoE) under the Ministry of Environment and Forests (MoEF) to enhance the technical capacity of the government staff in climate change related policy and programme development (CCC/GoB, 2015). Recognising the 'urgent and immediate' vulnerability of its development objectives to climate change, the GoB prepared the National Adaptation Programmes of Action (NAPA) in 2005 followed by

the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) (ibid.), of the MoEF in consultation with all relevant stakeholders. The government has established a separate trustee board namely the Bangladesh Climate Change Trust (BCCT) under the MoEF and up to June, 2014 sanctioned BDT 3.4 billion (£28.6 million) through 219 projects implanted by both the government and non-government organisations for combating climate change issues (BCCT/GoB, 2014). Furthermore, it has also been decided to secure 34 percent of the BCCT fund for emergency relief operations (ibid).

Bangladesh intends to incorporate DRR and CCA principles and practices into all development programmes and policies, sectoral policies and plans and in NGO programmes and plans (CCC/GoB, 2015). Mainstreaming DRR and CCA was one of the agendas of the government through CDMP (MoDMR/GoB, 2015). The government, development partners, humanitarian agencies and NGOs are already implementing development projects addressing DRR and CCA but the country has very little experience in dealing with climate change in practice. In these circumstances, the question should arise as to how DRR can incorporate CCA in project implementation, local knowledge and practice context.

1.3 Rationale, aims and objectives

As summerised at the beginning of the chapter, the present study aims to critically examine how the theoretical concepts and international and national level policies of integrated DRR and CCA work in practice at community level for an extreme disaster prone country context. Despite a limited degree of literature focussing on integration of DRR and CCA at community level, some recent studies have found the strengths of integrating DRR and CCA at community level (Schipper and Pelling, 2006; Thomalla et al., 2006; Mitchell and van Aalst, 2008; Venton and La Trobe, 2008; Birkmann and von Teichman, 2009, 2010; Schipper, 2009; Mercer, 2010; Gero et al., 2011). Meanwhile recent international policy developments both by the actors of DRR and CCA (e.g. UNFCCC and UNISDR) have pursued to implement appropriate initiatives at local level (IPCC, 2012, 2014; UNISDR, 2015). Further studies suggest community engagement in decision-making processes at local level can assist to implement development works, particularly DRR and CCA initiatives (Few et al., 2007; Tompkins et al., 2008; Collins et al., 2009; Ayers, 2010; Dodman and Mitlin, 2011).

Bangladesh is one of the most disaster prone countries in the world with its innate propensity to high climate change impacts. Despite its long historical background of manging disasters and their risks, communities including vulnerable groups are often trapped by climate induced disasters. The government and development partners are working for mainstreaming and implementing an integrated DRR–CCA approach across scales and sectors, particularly at local level (CDMP, 2015).

Within this context of the present research therefore aims to contribute towards the issues by critically examining the understanding of the disaster–climate change nexus at the community level in relation to how internal (i.e. social vulnerability, and coping and adaptive capacity) and external factors (actors and their interventions) are changing in a climate change context. It reveals a hitherto undeveloped political ecology of disaster and climate change related survival in Bangladesh.

Given this context and the aims of the thesis, the objectives of the study are to:

- Revisit the social vulnerability of communities in changing environments;
- Analyse the changing trends of community knowledge, experiences and practices in terms of coping with environmental disasters and adapting to climate change;
- Investigate the DRR and CCA conundrum of implementing national policies at local level in highly disaster prone Bangladesh context; and
- Explore transformations of local socio-cultural landscapes through external interventions in an integrated DRR–CCA context of rural Bangladesh.

The research examines complex of issues surrounding CCA and DRR in Bangladesh, a developing as well as disaster prone country that is also considered as being at one of the highest predicted risks of severe climate change impact. Furthermore, being a Bangladeshi motivated the researcher to choose the country as the study area of his research. As a Bangla (Bengali) native speaker, the researcher settled into the communities that form the focus of this research straightforwardly. The researcher was also driven by more than 11 years of professional and research experience in the selected study areas. The aims, planning and implementation of the study thus portrayed a key outcome of the author's academic and professional experience.

1.4 Contribution to new knowledge

The original contribution of the thesis is in explicating DRR as a core adaptation strategy for climate change through intensive understanding of integrated DRR and CCA at the community level. Whilst the previously disparate policy level perspectives that had put DRR and CCA into different camps are narrowing, there are to date no detailed and locally grounded empirical studies that examine DRR as an adaptation strategy to climate change. By focusing on community vulnerability and capacity (i.e. local knowledge and experience driven coping and adapting strategies and mechanisms, and external assistance) to reduce the risks of climate induced disasters in an integrated DRR and CCA context, this study contributes to knowledge by empirically grounding this discourse for everyday life in Bangladesh. This intends to assist in overcoming the interpretational and practical challenges associated with integrating DRR and CCA from community to global level perspectives.

1.5 Structure of the thesis

Chapter two provides a critical analysis of the literature on the theories concepts and policies of DRR and CCA in relation to their integration in practice across scales and sectors. It reveals the underpinning understanding of risk and vulnerability in disaster – climate change context. It also conceptualises the approaches to DRR and CCA, with particular focus on community engagement in local level external interventions in the developing world. This chapter also develops a conceptual framework for answering the research questions of the thesis.

Chapter three explains the country profile of Bangladesh primarily focusing on disaster and climate change nexus. This chapter presents the critical analysis of natural hazards, disasters and vulnerability in a changing environment. It also illustrates the history and trends of disaster management systems and actors of DRR and CCA disciplines, including community coping and adaptive response and capacity to reduce disaster and climate risks, and the recent initiatives taken by the government and development partners for mainstreaming integrated DRR and CCA across scales.

Chapter four narrates the methodological approach and research methods of the study to collect and analyse empirical data of community vulnerability, response and adaptive capacity to environmental disasters and external interventions in climate change context. This chapter reflects on research design, strategies of the fieldwork,

and selection of the study area and respondents. The study uses an inductive methodological framework with primary focusing on qualitative research methods: semi-unstructured in-depth interviews, focus group discussions (FGDs), participatory rural appraisal (PRA) tools, researcher's observation and informal conversation. Besides these techniques, the study collected quantitative data through conducting a structured questionnaire survey in a particular situation. The chapter also highlights the process of data analysis and some limitations of the fieldwork, particularly associated with the methods used.

Chapter five is the first empirical chapter redefining of people's social vulnerability in the disaster and climate change risk context. In this chapter, localised experiences of natural hazards and environmental disasters, and community perceptions of observed climate change and future climatic risks are critically analysed. The chapter also illustrates the nature and multiple dimensions of social vulnerability to environmental disasters in a changing environment.

Chapter six, the next empirical chapter, demonstrates local knowledge, experiences and practices in relation to environmental disasters and how these localised knowledge systems and practices assists communities to reduce their vulnerability. This chapter focuses on spatial differences between coping and adapting strategies and mechanisms practised by the char-dwellers of Jamuna river basin and the cyclone survivors from the coastal Bangladesh. The chapter also identifies how climate change creates potential threats to local knowledge and practices.

Chapter seven, the third and last empirical chapter, evaluates the DRR and CCA conundrum of national level policy and local level practice and how external interventions influence rural communities in Bangladesh. It highlights the institutional response to and politics of implementing the national policy framework of integrated DRR and CCA at local level. This chapter also explores how a political ecology of climate change perspective is further marginalising the vulnerable people of highly disaster prone areas and threatening against their inherited knowledge, experiences and practices.

Chapter eight critically demonstrates how the global and national level understanding of DRR and CCA may fail to achieve certain targets for reducing vulnerability to disaster risks at local and community level, and enhancing community resilience. It illustrates the differential implications of the international and national level DRR and CCA conundrum for communities and other actors across scales and sectors. This

chapter also argues how DRR can play the vital role as an adaptation strategy to climate change in highly disaster prone rural Bangladesh context. It also indicates how community engagement in local level decision-making processes can assist to implement appropriate external interventions of DRR and CCA.

Chapter nine concludes through summarising the substance of the main arguments made in this thesis outlining some of the core implications and further research trajectories.

Chapter Two

Conceptualising the integration of community-based DRR and CCA

CHAPTER TWO

Conceptualising the integration of community-based DRR and CCA

2.1 Introduction

Policy thinking is that climate change adaptation and disaster risk management both seek to reduce factors and modify environmental and human contexts that contribute to climate-related risk, thus supporting and promoting sustainability in social and economic development (IPCC, 2012; Mercer et al., 2014). This chapter explores in more depth the interwoven relationship between DRR and CCA within the context of climate induced disaster risk. The first section reviews the underlying understanding of a disaster – climate change nexus. The chapter then focuses on the concept of disaster management, coping mechanisms, disaster resilience and adaptation strategies. Finally, the chapter critically explores how DRR and CCA are incorporated in academic and policy level dialogues.

2.2 Understanding risk and vulnerability in disaster – climate change nexus

Disasters and climate change are interlinked. Though the prevailing understanding of disaster is as a continuing process, disaster impacts are visible at the local level. Thus, local knowledge and experience as well as more formalised scientific processes can be examined, criticised and revisited to address even the basic concept of disaster. However, climate change is still based on scientific prediction through computer modelling rather than on long term experience that drives people's understanding and engagement at community level and informing its wider interpretation (IPCC, 2012). The consequence is that scientific and varying forms of academic scholarship are studying climate change from different dimensions. Whilst this can be in some senses a healthy learning process, it can have serious implications for other actors in the field who are bargaining their positions at policy and practical levels based on those scientific projections and academic understandings. Though climate change is an interwoven discipline, it could be argued that disaster prevention and response is the primary concern in applying science to practice (IPCC, 2013). In these circumstances, understanding of vulnerability and risks of disasters and climate change is critically important.

2.2.1 Natural hazards and environmental disasters in relation to risk and vulnerability

Hazards and disasters are commonly used terms around the world. It can be generally quite difficult to define and distinguish between a hazard and a disaster in communication. People are generally used to disaster-related information through modern communication systems and are interested in hearing this kind of news, but they rarely know how and when a hazard becomes classified as a disaster. Not knowing of impending disaster then puts people into a more vulnerable situation. In addition, it is important to ascertain who are more vulnerable in disasters, in terms of geographical location or socio-economic status, and how they adapt to such disasters (Yohe et al., 2003). Apart from people's general understanding, studies of hazard and disaster from varying perspectives reveal how they are related to contrasting determinants (i.e. environmental, political, social, cultural and economic) and the interpretations thereof (Torry, 1979; Briguglio, 1995; Middleton and O'Keefe, 1998; Wisner et al., 2004; Schipper and Pelling, 2006; Cardona, 2008; Collins, 2009).

A hazard is an event or physical condition that has the potential to cause fatalities, injuries, damage and loss to each and every sector (FEMA, 1997). Some hazards are *place* and *time* specific; others are not. Some places are exposed to multiple hazardous at the same time. On this basis UNISDR (2009b: 17) defines a 'hazard':

> "[is] a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage."

A simple interpretation is that a hazard is a condition with the potential for harm to different communities or environments at different times. Here when hazard is a *potential* event, disaster is an *actual* event. Tobin & Montz (1997) define disaster as an event that has a large impact on society which may or may not lead to deaths, but it usually has severe economic impacts. These negative impacts are widely spread over different sectors. Some individuals or societies can cope with such devastating losses using their capacities but others cannot do so. As such, UNISDR (2009b: 9) defines 'disaster' as:

> "A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts,

> which exceeds the ability of the affected community or society to cope using its own resources."

Fordham (2007) defines disaster as an event in which a community undergoes severe danger and incurs, or is threatened to incur, such losses to persons and/or property that the resources available within the community are exceeded. It can be structured such that disaster is an actual event that has direct damage and indirect losses on a country or community or even on a person that exceed the ability of the affected society or individual to cope with the situation without external assistance.

All people or groups in a society or place are not equally affected by a particular hazard since 'societal structure' is in relation to economic, social, political, natural and physical aspects that can determine it. People of the developing world especially the poor and extreme poor are more vulnerable to different disasters such as floods, cyclones, earthquakes, droughts and so on (Wisner et al., 2004). When people's circumstances in being able to deal with natural hazards become central to survivability, 'vulnerability' becomes a core theme. Thus, vulnerability is closely linked with hazard and to the disaster. Vulnerability is defined as (UNIDR, 2009b: 30):

> "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard."

There are many aspects of vulnerability arising from different factors (i.e. environmental, social, economic and physical) such as inappropriate environmental management, lack of public information and awareness, inadequate protection of livelihood assets and poor design and construction of building. Vulnerability differs across spatial and temporal scales (ibid.).

Vulnerability and capacity are interlinked. The failure of individual or collective capacity to deal with the adverse impacts of a hazard may accelerate the hazard to expose a disaster. It is observed that the societal condition or socio-economic status of an area vulnerable to natural hazards often determines the economic losses (Munich Re Group, 2002; Hilhorst and Bankoff, 2004; Wisner et al., 2004). Compared to other parts of a community, those with resources and social capital overcome their damage and losses using their own capacity without receiving any external assistance, whereas the poorer groups or those without this level of self-organisation and protection cannot

overcome their losses, even though they are primarily targeted by humanitarian groups (IFRC, 2009, 2014). The strength of social capital is often influenced by its horizontal bonding and bridging amongst the different societal strata within a community and its vertical linking with external individuals and groups of the community (Cutter et al., 2000; Pelling and High, 2005). Community-based social capital may aid to recover and to compensate for the weakness of external institutional management in reducing disaster risks (Adger, 2003). Nonetheless, rural power structures in the developing world are often such that the local elite group has enormous access to and control over land, natural resources and even external disaster aid (Cutter et al., 2000; Cutter, 2006; IFRC, 2014). Local elites also act as local key informants and can over-whelm participatory activities of different projects hampering the achievement of the expected project outcomes (Mansuri and Rao, 2013). Thus, vulnerability does not mean only economic losses, particularly in terms of volume and ownership of assets, but means also how the losses and damages relate to rights and livelihoods (DFID, 1999; Collins, 2009; Cannon, 2010).

In relation to "risk" of disaster, Smith and Petley (2007) identify risk as the probability of hazard occurring and creating disaster damage and losses. Here hazard is a natural event whereas risk is primarily related to human acts. For example, the people who live in river char-lands in Bangladesh are regularly affected by recurrent floods and face huge economic losses. If those people move to a flood free area, the risk will be gone. However, the complexity of the real world is interlinked with an array of environmental, social, economic and interpretational factors (Hewitt, 1996). Alexander (2000) argues that vulnerability refers to the potential for casualty, destruction, damage, disruption or other forms of loss in a particular element, and risk combines this with the probable level of loss to be expected from a predictable magnitude of hazard. Thus, risk depends on people's vulnerability and potential impacts of hazard. Wisner et al. (2004) state that there are three elements: risk (disaster), vulnerability and hazard, whose relations are found to schematise in a *pseudo-equation*:

$$\text{Risk (Disaster)} = \text{Hazard} \times \text{Vulnerability}$$

They then show how this is offset by capacity of people to address hazard and reduce vulnerability. A disaster occurs when a significant number of vulnerable people

experience a hazard and suffer severe damage and/ or disruption of their livelihood system in such a way that recovery is unlikely without external aid. They also study risk in terms of the vulnerability analysis in specific hazard situations by use of the Pressure and Release (PAR) model that indicates two folded disaster risks: hazard specific risks and vulnerability based risks.

Thus, the understanding of disaster in relation of hazard, vulnerability and risk is complex. The literature of disaster studies shows that the subject is interwoven into different academic themes including engineering, environmental and social sciences (Cutter, 1993; Latour, 1999). Disaster is also often addressed and interpreted through a development or sustainability perspective (Collins, 2009). However, in this thesis, the prevailing understanding of disaster is primarily focused within a climate change perspective.

2.2.2 Climate change impacts and their associated risks

For most people, the expression 'climate change' means the alteration of the world's climate that humanity is causing, through fossil fuel burning, clearing forests and other practices that increase the concentration of greenhouse gases (GHG) in the atmosphere. This is in line with the official definition of climate change by the United Nations Framework Convention on Climate Change (UNFCCC) in its Article 1 (1992: 7) that:

> "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods".

The UNFCCC further constructs distinct notions of climate change between "anthropogenic climate change" and "natural climate variability". However, scientists often use the term for any change in the climate, whether arising naturally or from human causes. In particular, the IPCC (2014: 120) defines it as follows:

> "Climate change refers to a change in the state of the *climate* that can be identified (e.g. by using statistical tests) changing in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or *external forcings* such as modulations of the solar cycles, volcanic eruptions and to persistent anthropogenic changes in the composition of the atmosphere or in *land use*."

Climate change, often treated as one of the most severe environmental problems confronting sustainable development (Norgard, 1994; Gómez-Echeverri, 2000; O'Riordan, 2000; Schipper, 2007), affects both ecological (forests, grasslands, wetlands, rivers, lakes & marine environments) and human systems (agriculture, fisheries, water resources, coastal resources, health, financial institutions and settlements) (IPCC, 2001). It can also increase vulnerability to unrelated, non-climatic hazards (O'Brien et al., 2006b). The IPCC (2001) predicted that some areas would face more extreme events including floods, tropical cyclones and droughts. Developing countries are particularly affected by climate change though the developed world is primarily responsible for increasing emission of GHGs (IPCC, 2001; O'Brien et al., 2006b). One of the major critiques is that the whole scenario of climate change impact is largely based on scientific prediction rather than local knowledge and experience. However, except for 1996, the scientific knowledge is able to tell us that overall all of the past 10 years rank among the 10 hottest years since 1850 (Helmer and Hilhorst, 2006).

Therefore, countries are actively discussing and negotiating ways to deal with the climate change problem, within the UNFCCC. IPCC (2001) argued the first task is to address the root cause by reducing GHGs emissions from human activity, known as 'mitigation'. The second task in responding to climate change is to manage its impacts. Coping with the changed climate conditions is called 'adaptation' (IPCC, 2001; UNISDR, 2008b).

Climate change is nowadays one of the most debatable issues amongst international scientists and academicians. They are arguing about its level of change, actors responsible, finance, justice, policies, strategies, applications and so on. Even this group are not agreed about existing arguments providing understanding about climate change. However, in a broad view, most scientists have agreed climate change is happening. Though global climate has been changing for a very long period, there is evidence that recent human activities are accelerating its rate of change which indicates two processes going on at the same time – anthropogenic climate change and natural climate variability (IPCC, 2014). Adger and Brooks (2003) argue that risks associated with these changes are real but highly uncertain. This 'uncertainty' continues to hamper the establishment of precise policy and implementation plans from the global to the local levels. The global climate negotiators rarely come together to make clear and certain decisions that can combat climate risks at the local level.

However, there are ample opportunities for scientists to examine climate change impacts and necessary actions at the local level. For example, Bangladeshi agricultural scientists are working on innovating different saline – and drought–tolerant rice varieties for the local farmers adapting to potential climate risks (BCCT/GoB, 2014).

The developing nations are still struggling to achieve the Millennium Development Goals (MDGs) and political commitments even without the concern of climate change. Climate change in terms of increased temperature, unpredicted extreme events and changes in precipitation poses additional risks for developing countries and vulnerable communities already striving to alleviate poverty and to achieve sustainable development (Huq et al., 2003, 2004). Barnett and Adger (2007) also add that these climate-induced risks are increasingly being called a 'security' problem that may increase the risk of violent conflict. Thus, according to their arguments, climate change is increasing people's vulnerability and reducing their capacity to cope with disasters. Vulnerable people are struggling to live in their uncertain situation and fighting to ensure their access to natural resources which are also threatened by climate change. Climate change impacts and responses are presently observed in physical and ecological systems (Adger and Brooks, 2003; Adger et al., 2005). Therefore, societal vulnerability to the risks associated with climate change may exacerbate ongoing social and economic challenges, particularly for those parts of societies dependent on resources that are sensitive to changes in climate. Violent conflict and unavailability of resources may increase forced migration particularly from rural to urban areas in the developing world (IDMC, 2009; Werz and Conley, 2012).

Byravan and Rajan (2008) focus on an important set of social impacts resulting from climate change in South Asia, namely the potential displacement of vast numbers of people as a consequence mainly of sea level rise along the coasts and secondarily from drought in rural areas. According to their argument climate change impacts often turn into unpredicted disastrous exposure around the world particularly in developing countries. These climatic changes will modify the present trend of human migration and the immediate response to disasters in the low-income countries in the near future. Such migration, from more vulnerable areas to least vulnerable areas, may be a 'solution' rather than a 'problem', as a form of coping with global environmental change by potential climate victims (Foresight: Migration and Global Environmental Change, 2011; Black et al., 2013). However, Penning-Rowsell et al. (2013) argue that

disaster victims generally do not want to migrate to strange and sometimes unsafe urban slums unless their local livelihoods are destructively affected.

Like disaster risks, climate change risks can also be divided into two dimensions – "impact-based" and "vulnerability-based" risks. In the impact based perspective for assessing risk, scientific and technological expertise is needed for governing climate change policy formation (Ayers, 2011) and predicting future climate potential impacts and initiating probable measures (Pelling and High, 2005). In the vulnerability-based perspective, risk assessment is shifted from climate change impacts to the local circumstances of vulnerability (Ayers, 2011) that indicate how to respond to uncertainty resulting from social and environmental interactions (Pelling and High, 2005). Thus, it is important to explore "social vulnerability" to understand disaster risks in the climate change context.

2.2.3 Social vulnerability and disaster risk in a changing environment

Vulnerability is a complex issue to understand although in the disciplines of disaster and climate change studies often concentrate on vulnerability (Table 2.1). Recent vulnerability studies tend to incorporate both disasters and climate change so as to understand the underpinning relationships between disasters and climate change and how these relationships influence the circumstances of vulnerability.

Table 2.1 | Vulnerability studies in disaster risk – climate change context

Theme	Relevant studies
Environmental disasters	O'Keefe, et al, 1976; Aysan, 1993; Burton et al., 1993; Blakie, et al., 1994; Cannon, 1994; Comfort, et al., 1999; Puente, 1999; Anderson, 2000; Cutter, 1996; Lewis, 1999, 2009; Bankoff, 2001, 2004; Cutter et al., 2001, 2003; Weichselgartner, 2001; del Ninno, et al., 2002; Pelling, 2003; Cardona, 2004, 2011; Wisner, et al., 2004; Nelson, 2005; Birkmann, 2006; Cannon, 2006; Berkes, 2007; Hewitt, 2007
Climate change	Dow, 1992; Adger, 1996, 2006; Brenkert and Malone, 2005; Brklacich and Bohle, 2006; Gallopin, 2006; Smit and Wandel, 2006; Füssel, 2007; IPCC, 2007; O'Brien, et al., 2007; Schneider, et al., 2007; CARE International, 2009; Gaillard, 2010; Moser, 2010
Climate induced disasters	Milly, et al., 2002; Adger and Brooks, 2003; Sperling and Szekely, 2005; Schipper and Pelling, 2006; Thomalla, et al., 2006; Mercer, 2010; IPCC, 2012

(Source: Author)

Further, in the context of disaster management and climate change, vulnerability studies often focus on social factors (Bohle, et al., 1994; Adger, 1999; Cutter et al., 2003; Davis, et al., 2004; Cutter and Finch, 2008; Zomer et al., 2008). Adger (1999) defines vulnerability as an individual or community exposure to livelihood stresses due to climatic changes. Bohle et al. (1994) argue that differential impacts of future climate change on vulnerable groups will be difficult to measure due to the complexity of social relations. Adger (1999) also adds that institutional and economic factors associated with the economic transition from national planning in Vietnam boosted social vulnerability. However, other factors ecological, political and economic also have great influence on people's lives and livelihoods (Briguglio, 1995; Bohle, 2011), that protect them from extreme weather and climatic events by increasing disaster resilience (Folke, 2006; Manyena et al., 2011; Aldrich, 2012; Bahadur et al., 2013; Zebrowski, 2013; Manyena and Gordon, 2014).

Climate change impacts change in frequency and magnitude of hazards (IPCC, 2001, 2012, 2014). Current levels of response to disasters will no longer be sufficient in a significantly changed climate (Sperling and Szekely, 2005). The UNISDR (2009a) warns that even small increases in hazard levels due to climate change will have an enormous magnifying effect on disaster risk. Thus, both climate change and disaster risk have clear consequences for development and they are interlinked (O'Brien et al., 2006a; Schipper and Pelling, 2006). The EM-DAT data show that climate related disasters caused 40 percent of world disaster deaths between 2005 and 2014 (IFRC, 2015). However, during the decade, Asia accounted for 66 percent of the total number of death from climate related natural disasters (ibid.). Adger and Brooks (2003) correctly alerted that developing countries are more vulnerable to climate related disasters for dealing with the adverse impacts of climate change.

Under article 4.8 of the UNFCCC, disasters are only mentioned in relation to consideration of countries that are the most vulnerable to climate change (Schipper and Pelling, 2006). Conversely, until recent disaster scholars and practitioners rarely engaged in climate change debates (Helmer and Hilhorst, 2006). However, even in these contexts it has been realised that the most effective way of addressing the risks of climate change and disasters is to lessen the underlying factors causing vulnerability (Sperling and Szekely, 2005; Schipper and Pelling, 2006). Thus, vulnerability is a key concept to bridge the understanding of and the response to climate change related risks and the impacts of disasters (Helmer and Hilhorst, 2006).

Disaster risks can increase or decrease over time according to a country's ability to reduce its vulnerability and strengthen risk governance capacities. In recent decades, countries in all regions have strengthened their capacities to reduce mortality risks associated with major weather-related hazards such as tropical cyclones and floods (Coppola, 2006). Despite more people living in flood plains and along cyclone-exposed coastlines, mortality risk in relation to population size is falling (Ikeda, 1995; Emanuel, 2000, 2007; Wisner et al., 2004; O'Brien et al., 2006a; Collins, 2009). In contrast, many countries are struggling to address other risks such as economic losses (Wisner et al., 2004; UN, 2011). Moreover, losses suffered by low-income households and communities due to frequently occurring extensive disasters are often under-recorded and are increasing rapidly (UN, 2011).

Coppola (2006) observes five trends in recent global disaster history. These include increasing trends in unexpected natural events, number of disasters, economic losses, number of affected people, but decreasing environmental disaster related deaths. The later has improved due to increased disaster response activity. Disaster studies is an interdisciplinary subject related to many components (Table 2.2). It is a complex scenario to determine which component plays the most vital role in influencing disaster risk; how, where and when. Thus, it can be analysed how individual or societal vulnerability is increasing even though many initiatives are taken to reduce these influences on disaster risk in a changing environment.

Table 2.2 | Diversification of disaster studies

Components	Relevant studies
Sustainable development	Cuny, 1983; Middleton and O'Keefe, 1998; McEntire and Myers, 2004; Schipper and Pelling, 2006; Collins, 2009
Poverty reduction	Blaikie et al., 1994; Adger, 1996, 1999; DFID, 2004; Wisner et al., 2004; GoB, 2005; Mechler et al., 2006; Hellmuth et al., 2007; Huq and Reid, 2007
Community resilience	Adger, 2000; Klein et al., 2003; Manyena, 2006; Gaillard 2007; Kelman, 2008; Lewis and Kelman, 2009; Aven, 2011
Sustainable livelihood	Chambers and Conway, 1991; Scoones, 1998; Ellis, 2000; DFID, 1999, 2006
Agricultural development	Biswas, 1979; Carson, 1992; El-Beltagy et al., 1997; Brammer, 2004; DFID, 2005
Globalisation	Oliver-Smith, 1998; Alexander, 2006; Mohammad, 2010
Health and education	Noji, 1997; Murphy, 2007; Shaw et al., 2011; Southwick et al., 2011
Water	Micklin, 1988; Geis, 2000; Nihoul et al., 2004; Gandy, 2008; Briscoe, 2009; Hussam, 2009
Food security	Dilley and Boudreau, 2001; Watts, 2008; Oxfam International, 2011
Environmental conservation	Torry, 1979; Mirza and Paul, 1992; Tran and Shaw, 2007; Trabucco et al., 2008
Climate change	Sperling and Szekely, 2005; O'Brien et al., 2006ab; Schipper and Pelling, 2006; Thomalla et al, 2006; IPCC, 2007, 2012; UNISDR, 2008a, 2013; UN, 2009, 2011; Bouwer, 2011; Kelman, 2015

(Source: Author)

The research carried out in the context of this thesis was conducted to understand the disaster risk – climate change nexus in terms of how climate change influences disaster risk and consequent implications for DRR and CCA in a very high risk location. A driver for it has been that people in high risk locations are implicated by the number of extreme environmental events associated with climate change and their sectoral impacts (IPCC, 2007). Table 2.3 outlines the sectoral impacts.

Table 2.3 | Impact of climate change on disaster exposure and its sectoral impacts

Sectors	Extreme environmental event	Impacts
Water	• Droughts • Heavier precipitation induced floods	• Decreasing availability of melt water from mountain ranges • Increasing conflict for water amongst neighbours at different level from individual to international
Food	• Droughts • Floods	• Decreasing crop production • Increasing the number of people at risk from hunger • Increasing level of displacement and migration
Infrastructure	• Sea level rise • Floods • Tropical cyclones	• Increased infrastructure fragility, particularly where situated in coastal regions and low-lying flood prone zones • Increasing economic losses • Decreasing livelihood options • Unplanned industrialization
Settlement	• Sea level rise • Floods • Tropical cyclones	• Settlements of coastal and low-lying floodplain put at risk • Increasing housing cost • Increasing displacement and migration • Unplanned urbanization
Health	• Heat waves • Floods • Storms • Fires • Droughts	• Health status of millions of people altered through deaths, disease and injury • Increasing proneness of malnutrition, malaria and diarrhoeal disease • Public health and Development Goals threatened by long-term damage to health system.
Biodiversity	• Sea level rise • Floods • Tropical cyclones • Droughts	• Increasing salinization over wider areas • Increasing destruction of ecosystems by extreme events • Increasing human impacts through human displacement and environmental encroachment

(Source: Author adopted from IPCC (2007))

It is not possible to confirm with certainty that all disaster-related effects are climate change driven or indeed that all of these have been the driving concern of disaster and climate related issues in Bangladesh. However, it is observed from recent studies that hazard trends are changing whilst community vulnerability is in some ways increasing (IPCC, 2012). There is however plenty of evidence that many climate-induced extreme events have been occurring in the past few decades. For example, many coastal regions around the world are affected by increasing numbers and intensity of

strong tropical storms, submergence, flooding and erosion with a high potential of additional losses of human lives, assets and natural resources (e.g. coral reefs, mangroves, fishery habitats) throughout the 21st century and beyond, primarily due to sea level rise (IPCC, 2014). Climate change is not only increasing hazard specific risk but also creating and spreading multiple hazard risk. Thus, climate induced disaster risk may hamper people's capacity to cope, in effect manipulating existing disaster management initiatives. Climate variability and climate change due to rising greenhouse gas emissions will increase temperature and sea level, and change rainfall patterns over the next few decades that will significantly affect coastal ecosystem and associated human livelihoods (Schipper and Pelling, 2006; IPCC, 2012, 2014).

2.3 Conceptualising disaster risk reduction: Paradigm shift from 'relief and response' to 'integrated disaster management'

The previous section discussed the concept of disaster in terms of risk and vulnerability, and how it is interlinked with climate change. Apart from people's inherited coping mechanisms, many initiatives have been undertaken by external actors to reduce people's vulnerability and disaster losses. A more integrated approach recognises that it is also important that the concept, nature and activities associated with the field of disaster management are considered in terms of the understanding of disaster reduction processes by the people who are primarily affected at the local level.

'Relief and response' approaches have been exercised over a long period including the last few decades of disaster reduction. The formalised aspect of this notably 'reactive' approach has been primarily based on a 'command and control' approach (Wisner et al. 2004). This is also considered as a top-down approach where primarily decisions formulated from the central position are disseminated to field level through a structured system. 'Relief and response' was the main approach from government largely influenced by help that emanates from developed countries and donors. This approach is strictly implemented in many developed countries through the Blue Light services (O'Brien et al., 2006a). The activities associated with the approach are mainly limited to rescue, emergency response and reconstruction. The activities associated with this approach are nonetheless also considered as essential aspects of disaster management in the developing world, particularly in responding to rapid on-set hazards that include earthquakes, tropical cyclones, landslides and flash floods.

The government of a developing country prefers relief activities as they are good for chasing votes and international recognition (Schipper and Pelling, 2006; Hewitt, 2007). They also add that NGO activities in these parts of the world mainly focus on humanitarian assistance to disaster survivors so as to acquire funding.

Since the 1980s and 1990s disaster management actors, including national and local governments, NGOs and development partners have been exploring and started to draw from a new paradigm in their policies and planning. This new 'proactive' approach considers all phases of disaster management rather than simply the post-disaster phase (Maskrey, 1989; Kreimer and Munasinghe, 1990; Blaikie, 1994; Wisner et al., 2004; IPCC, 2012). Though, at the initial level, this has been a paradigm driven by a 'command and control' model, later this has in many instances evolved to be implemented through a 'community-based model'. This more bottom-up approach results from understanding of the need to address localised problems and solutions at the local level (Blaikie et al., 1994; Wisner et al., 2004; ADPC, 2007; Shrestha et al., 2008; Collins, 2009). However, this approach scientific along with other expert opinions at the regional and national level are needed to formulate regional and national level plans of action. Furthermore, apart from the activities of the post-disaster phase, there are many pre-disaster activities that include preparedness, mitigation and prevention as part of the wider field of disaster management.

DRR is broadly an approach that includes all action aimed at reducing disaster risks. Actions can be political, technical, social and economic. DRR includes preventative initiatives as varied as policy guidance, legislation, preparedness plans, agricultural projects, an insurance scheme, or even a swimming lesson. The approach enables people to think and work across society, to make sure that everyone – from governments to individuals – makes the right decisions to reduce the risk and impact of a potential disaster. By doing so, a coming storm or flood will not be able to turn into a disaster. UNISDR (2009b: 10-11) defines DRR as:

> "The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events."

DRR policies and strategies include viewing disasters as socioeconomic and political in origin, reflecting a school of thought established since the 1970s (Torry, 1978, 1979; Hewitt, 1983, 2007; Lewis, 1999; Wisner et al., 2004; Gaillard et al., 2007) within the international development community (Lewis, 1999; Wisner et al., 2004). Many countries are incorporating DRR in their development projects for reducing vulnerability (IFRC, 2002; EC, 2003; Burton and van Aalst, 2004; van Aalst and Helmer, 2004; Sperling and Szekely, 2005) and utilising it at the grassroots level to address all forms of hazards (Mercer, 2010). This is now also further consolidated with the ratification of the Sendai Acord for Disaster Risk Reduction 2015-2030 (UN, 2015).

Many scientists, policy-makers and practitioners have believed that reducing disaster impact is an urgent task at the political level (Middleton and O'Keefe, 2001; Knegt, 2002; DFID, 2004; UNDP, 2004; Wisner and Walker, 2005). The earlier Hyogo Framework for Action 2005-2015 (HFA) had consequently aimed to progress disaster risk reduction, especially from an institutional point of view, in the passing of national legislation, in setting up early warning systems and in strengthening disaster preparedness and response (UNISDR, 2011). Though some progressions of early warning and disaster preparedness, particularly in many developing countries, have been observed since HFA formulated, more attention is needed to identify the missing instruments and initiatives at the local and national level for managing disaster risks and the causes and trends of higher hazard exposure and economic losses (UN, 2015). Thus, the Sendai Framework for Disaster Risk Reduction 2015–2030 identifies four priorities of actions for: (i) understanding disaster risk; (ii) strengthening disaster risk governance to manage disaster risk; (iii) investing in disaster risk reduction for resilience; and (iv) enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction (ibid.).

2.4 Understanding climate change adaptation

Countries are actively discussing and negotiating ways to deal with the climate change problem, within the UNFCCC. The IPCC (2001) argued the first task is to address the root cause by reducing greenhouse gases (GHGs) emissions from human activity through reducing the sources of GHGs or enhancing their sinks (i.e. 'mitigation'). The IPCC (2007) identifies the technologies and human practices that can reduce sources

of GHGs. Many of these technologies focus on improving the efficiency of fossil fuel energy or electricity use and the development of low carbon energy sources including hydro, wind and nuclear power. In addition, terrestrial ecosystems provide an active mechanism (photosynthesis) for the biological removal of CO_2 from the atmosphere. Appropriate forest management and land-use change including reducing deforestation processes and enhancing reforestation and afforestation activities can protect these carbon natural sinks (IPCC, 2001; Smith et al., 2004). Another aim of the mitigation approach is to change people's behaviour and attitude for coping with a less carbon emission based lifestyle, particularly in the developed world. The second task in responding to climate change is to manage its impacts by coping with the changed climate conditions, commonly referred to as 'adaptation' (IPCC, 2001; UNISDR, 2008b).

Adaptation means adjustments in a system's behaviour and characteristics that enhance its ability to cope with external stresses (Brooks, 2003). Wisner et al. (2004: 113) argue that coping (or adaptation) is the manner in which people act within the limits of existing resources and range of expectations to achieve various ends. In the context of climate change, adaptation means the processes or adjustments which people make to reduce their vulnerability to climate variability and climate change (Burton et al., 1993; Smit, 1993, 1996; Stakhiv, 1993; Watson et al., 1996; Burton, 1997; Smithers and Smit, 1997; Smit et al., 2000; IPCC 2001; Olmos, 2001; Shaw et al., 2007). IPCC (2007: 869) defines adaptation as:

> "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities".

Examples of adaptation include preparing risk assessments, protecting ecosystems, improving agricultural methods, managing water resources, building settlements in safe zones, developing early warning systems, instituting better building designs, improving insurance coverage and developing social safety nets (IPCC, 2001). These measures are intrinsically linked to sustainable development, as they reduce the risk to lives and livelihoods and increase the resilience of communities to all hazards (Agrawala, 2005; UNISDR, 2008a). People have been adapting for centuries to climatic trends and extremes at community level (Brokensha et al., 1980; Campbell, 1990, 2006; Inglis, 1993; Nunn and Britton, 2001; Gaillard, 2007; Nunn et al., 2007)

but it will be a new and sometimes extreme challenge for them over the next several decades (O'Brien et al., 2006a).

Ideally, adaptation and mitigation should be considered jointly, as some adaptation measures can contribute to GHG emissions, while conversely mitigation measures can be planned to help reduce, and not inadvertently exacerbate, disaster risks (UNISDR, 2008a). Initially think-tanks and policy-makers considered adaptation strategies through a top-down approach derived from the original characterisation of the issue as a global environmental pollution problem (van Aalst et al., 2008).

Reviewing the opportunities of a climate fund, Bouwer and Aerts (2006) proposed a two-track approach – one track that attempts to secure CCA funding under the UNFCCC and the second track that improves mainstreaming of climate risk management in development efforts. They argued that developed countries would need to demonstrate much greater commitment to the funding of adaptation measures.

CCA strategies aim to reduce vulnerability to expected impacts of climate change (Mercer, 2010) and exist across local and global scales from community level responses through to local, national and international government interventions (UNFCCC, 2006; McGray et al., 2007). Most of the developing countries have developed their own NAPAs identifying appropriate areas in which adaptation strategies are essential to mitigate against adverse climate change effects (Mercer, 2010). However, a major criticism on CCA strategies is that CCA initiatives are hypothetical in the international arena and mostly project oriented in practice rather than disseminated amongst the local people (Mercer, 2010; UN, 2011).

As vulnerability can be on an individual, national and even international level, adaptation is also taking place at different levels. There are two main types of adaptation – structural (e.g. flood and cyclone shelters) and non-structural (e.g. sharing indigenous, traditional and local knowledge). Both methods can be taken onboard at the national to individual levels. However, structural adaptation is mainly taken on at a national or regional level whilst, on the other hand, non-structural adaptation is often utilised by local people who are regularly affected by hazards.

Adaptation to climate change is a process of reducing risks to human systems. Here adaptation policy refers to any broad governmental decision aimed at reducing the impacts of climate change (IPCC, 2001). One of the guiding principles of the NAPAs

is that countries adopt a streamlined process based on existing or ongoing studies and research and/or empirical and historical information and traditional knowledge, engaging a wide range of stakeholders, and delivering an action oriented document which enjoys wide national ownership and political endorsement. The broader context of national frameworks for sustainable development is important, as is the complementarity with plans and programmes under other closely related areas of global environmental concern such as desertification and biodiversity, and national sectoral policies.

Adaptation policies focus on the wider field of strategic adaptation. Selection of the appropriate strategies in particular locations such as Bangladesh is not straightforward. However, there is already acknowledgement that evaluation of existing capacity is necessary before selecting a strategy (ibid.). A constraining factor is that in reality, the poorest people of the developing countries have much fewer options for buffering themselves from the effects of climate change compared with people from the developed world or even the richer persons within their own country. Thus, vulnerability is the starting point for determining what adaptation measures is needed. There is some evidence within the IPCC synopsis that this vulnerability and adaptation analysis has to be undertaken within the context of the communities and/or systems that are likely to be affected by climate change and climate variability (IPCC, 2001, 2012, 2014).

2.5 Integrating community-based DRR and CCA: From knowledge and policy to practice

Both CCA and DRR have some communalities and differences (Shea, 2003; Sperling and Szekely, 2005; Thomalla et al., 2006; Kelman and Gaillard, 2008; Mitchell and van Aalst, 2008; Tearfund, 2008; UNISDR, 2008b) (Table 2.4). National governments have nonetheless to date failed to bring DRR and CCA together into national and local development planning and investment. There is a misconception accompanying this situation that CCA is purely an environmental issue, and DRR is limited to early warning, insurance and disaster preparedness and response (Mercer, 2010). It is becoming clear however that neither DRR nor CCA is about addressing disaster or climate change alone, but rather about confronting the societal context in which these challenges are occurring (O'Brien et al., 2006a; Collins et al., 2015).

Table 2.4 | Conceptualisation of integrated DRR and CCA at community level: Theoretical underpinning and policy making processes across scales

Level		DRR	Integrated DRR/CCA	CCA
International	Perception	Disaster risk management Shifting from "hard solutions" to "soft solutions" All hazards specific Shifting to Bottom up approach National & local scale Disaster resilience	Proactive approach Risk management Holistic approach Climate induced hazards specific Community based Global to local scale Community resilience	Proactive approach Climatic risk management Focused on scientific modelling & simulations All climatic factors oriented (for examples, variability of rainfalls & temperature) Top down approach Global & national scale Climate resilience
	Policy	Vulnerability reduction Sustainable development Resilience Humanitarian aid (need based) Hazard-specific preparedness & response DRR has visible evidence Human sustainability Strengthening governance & institutions	Sustainable development Managing climate induced disaster risks Vulnerability reduction Community resilience Right based approach Knowledge sharing from DRR to CCA Incorporating DRR into the financial mechanism of CCA Ecological & human sustainability Coordination between the two	Poverty eradication Sustainable development & equity Well-being Climate justice Climate funds (right based) Place- & context-specific adaptation CCA has strong funding mechanisms Ecological sustainability Establishment of governance & institutions
National	Perception	Proactive and bottom up approach Coping with existing risks Uncertainties to future (climate) risks Long history of DM Strong institutional arrangement Strengthening institutional capacity Disaster resilience	Proactive and bottom up approach Adjusting with present disaster & future climate risks Using experiences of DM at future climatic solutions Mainstreaming DRR & CCA at all development sector Multi- & cross-sectoral issues Community resilience	Proactive and bottom up approach Hazard related risk reduction Adaptation to future risks Uncertainties to new risks Long term (future) solutions Establishment of strong institutional set up Climate based adaptation
	Policy	Mainstreaming DRR at national & local level Micro plans & strategies Protecting disaster victims Livelihood diversification Strengthening governance & institutions Financial support for emergency response Strengthening coordinatior	Mainstreaming DRR & CCA at national policies, project formulation & budgetary mechanisms, and local level project implementation Both macro & micro level plans & strategies Community/social protection Economic & livelihood diversification Financial mechanisms for	Mainstreaming CCA at national & local level Macro plans & strategies Protecting vulnerable groups Economic diversification New policy & legal framework Financial support for adaptation Coordination amongst multi- & cross-sectoral

Level		DRR	Integrated DRR/CCA	CCA
		amongst multi- & cross-sectoral stakeholders	adaptation & emergency response Strengthening coordination amongst multi- & cross-sectoral stakeholders	stakeholders
Local	Perception	Proactive & community based approach Disaster resilience	Proactive & community based approach Community resilience	Proactive & community based approach Community based adaptation
	Policy	Coordinated with external & internal actors Highly political interest Societal needs Using local knowledge & practices for coping with existing disaster risks	Incorporating CCA into DRR Political commitments Incorporating societal needs in local plans considering societal values Incorporating local knowledge & practices	Adjusting with DRR activities Less political interest Societal values Incorporating local knowledge & practices for combating against future (climate) risks
Community	Perception	Risk perceptions of disaster are environment & livelihood related	Perceptions of risks Risk perceptions of climate induced disasters are also environment & livelihood related	Perceptions of climate change are environment & livelihoods related
	Policy	Risk perceptions Using local knowledge & practices	Risk perceptions Incorporating local knowledge & practices	Risk perceptions Incorporating local knowledge & practices

(Source: Author)

However, there is a general consensus that DRR and CCA should be integrated into wider development planning (Glantz, 1999, 2003; O'Brien et al., 2006a; Lewis, 2007; Christoplos et al., 2009). This has also been readily advocated within the emphasis of integrated disaster and development studies (Collins, 2009). The present study thus critically examines how the theoretical concepts and international and national level policies of integrated DRR and CCA work in practice at community level for an extreme disaster prone country context (Figure 2.1). The study is relevant to the entire field of interest represented by this diagram but focusses for its empirically derived research in Bangladesh on questions at the community level in terms of vulnerability to disaster risk, local knowledge and external intervention in the context of climate change (the three elements indicated in the bottom right corner of this diagram).

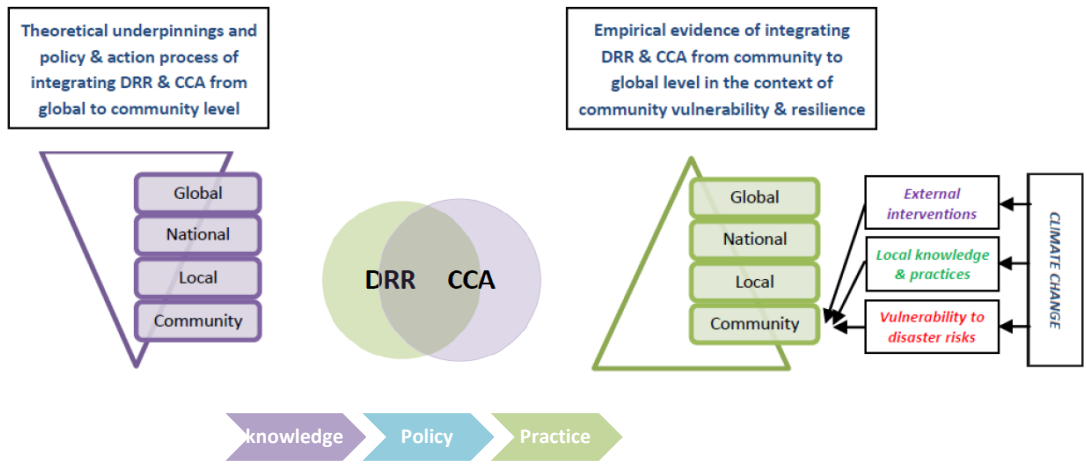


Figure 2.1 | Conceptual framework for the understanding of integrated DRR and CCA at community level

(Source: Author)

Many sources note a role for DRR in CCA (IPCC, 2001, 2007; AfDB et al., 2003; UNISDR, 2004a, 2009c; UNFCCC, 2004; Bouwer and Aerts, 2006; Helmer and Hilhorst, 2006). Mercer et al. (2007) stated that community-based DRR could thus provide an entry point for CCA including more recent community-based CCA work. It is the local perspective and evidence of this that has been missing, most noticeably so in those locations at high risk of climate change impacts. Section 2.7 discusses how local level approaches differ from community-based approaches. Climate change has been seen as an immediate and long-term threat to achieving MDGs and an integral part of disaster management (UNISDR, 2011). Resilience to climate change impacts is a matter of finding out how people will cope and then helping them to identify where help is needed so as to enable, complement and supplement their coping efforts (Thomalla et al., 2006). The next section discusses how adapting differs from coping.

2.6 Coping and adapting

"Coping" and "adapting" are often interchangeable in disaster studies. IPCC (2012) reports both coping and adapting as included in research and practice in terms of DRR and CCA. Coping is usually defined as a way of responding to an experienced impact with a shorter vision whereas adapting is a process of adjusting to both experienced and expected changes which is longer term (ibid.). Table 2.5 distinguishes between the two terms indicating several dimensions in which they differ. The table also

reports that coping focuses on immediate and unexpected stress, constraint and survival while adapting focuses on future change, learning and redevelopment. The present coping strategies and mechanisms assist a community or an individual to adapt to future impacts (Yohe and Tol, 2002; IPCC, 2012).

People prone to disaster risks often utilise their indigenous knowledge to cope (Twigg, 2004; Lavell and Lavell, 2009). Local people's coping mechanisms are however varied in terms of hazard, place and time and consequently often less well understood by external actors (Lavell, 2003; Twigg, 2004). Wisner et al. (2004) observed that, to cope with a normal drought, nomadic people in the Sahel have adopted the practice of herd diversification, involving camels, cattle, sheep and goats, all with different grazing habits, water requirements and breeding cycles that helped to spread any risk of pasture failure. However, when severe drought did occur such people could either eat or sell off the surplus livestock. Under severe conditions, they often start simply by eating less in an attempt to conserve food stocks. However, at present these drought-affected people mainly survive on international relief.

Table 2.5 | The various dimensions of coping and adapting

Dimension	Coping	Adapting
Exigency	Survival in the face of immediate, unusually significant stress, when resources, which may have been minimal to start with, are taxed (Wisner et al., 2004).	Reorientation in response to recent past or anticipated future change, often without specific reference to resource limitations.
Constraint	Survival is foremost and tactics are constrained by available knowledge, experience, and assets; reinvention is a secondary concern (Bankoff, 2004).	Adjustment is the focus and strategy is constrained less by current limits than by assumptions regarding future resource availability and trends.
Reactivity	Decisions are primarily tactical and made with the goal of protecting basic welfare and providing for basic human security after an event has occurred (Adger, 2000).	Decisions are strategic and focused on anticipating change and addressing this proactively (Füssel, 2007), even if spurred by recent events seen as harbingers of further change.
Orientation	Focus is on past events that shape current conditions and limitations; by extension, the focus is also on previously successful tactics (Bankoff, 2004).	Focus on future conditions and strategies; past tactics are relevant to the extent they might facilitate adjustment, though some experts believe past and future orientation can overlap and blend (Chen, 1991).

(Source: IPCC, 2012: 51)

At community level, people's own coping strategies in Bangladesh include cropping patterns, raising plinth and alternative livelihood options for dealing with flood risks (Haque and Zaman, 1993, 1994; Schmuck-Widmann, 1996; Brammer, 2004; Wisner et al., 2004). These strategies help local people not only to cope with existing disasters but also to prepare for the next one.

However, indigenous coping mechanisms cannot work properly if external disaster management systems fail. The Flood Action Plan (FAP) in Bangladesh provides a good example. After the severe floods of 1987 and 1988, the government and development partners initially planned an engineering solution to control the three major rivers (i.e. the Ganges-Padma, the Brahmaputra-Jamuna and the Meghna) along with their tributaries from 100-year floods through building long embankments and high dams. But the policy-makers failed to understand the local knowledge and cultural practices that would create unexpected threats to the local farmers' crop production according to their inherited traditional crop calendar, due to unavailability of normal flood water in their agricultural lands (Brammer, 2004). Later the projects have modified their original plan by ensuring normal water mobility from the rivers to their natural levees including floodplains, lakes and swamps. They build numerous sluice gates and culverts on major intersection points and incorporate local people in the local level decision making process, particularly to protect their lands and livelihoods. However, the aim of FAP, to protect Bangladesh from severe floods, was not achieved due to the failure of political, economic and institutional factors (Brammer, 2010).

Wider issues such as corruption, epidemics, conflict and wars challenge people's ability to cope or adapt. In China, 5,335 school-going pupils had died or remained missing after the 2008 Sichuan earthquake in what became a politically charged issue because of allegations of corruption and shoddy school construction (Divjak, 2008). Recently the widespread epidemic of the Ebola virus disease in West Africa claimed more than 9,000 lives (WHO, 2015). Fox (2014) argues that the failure of government healthcare systems after years of armed conflict in those countries was the primary reason to widespread of Ebola virus. Furthermore, excessive attention to Ebola is creating a new threat to healthcare system resulted in many people having failed to receive proper treatment for other infectious diseases such as malaria, cholera and measles (BBC, 2014).

Analysts predict that climate risk may be a threat for people's coping with disasters including non-climate related events (UNISDR, 2012). Climate funding may also result in the cutting down of humanitarian and other development funds for successful disaster management initiatives (UNISDR, 2010). Thus, local people may need to develop new innovations to address disasters so as to compensate for this loss. In these circumstances, the recently greater emphasis on 'community resilience' may reflect a new paradigm of better coping with disasters in the changing environment.

Resilience is a comparatively new theme in applied disaster studies. However, the concept of resilience has gained currency in this field in the absence of proper philosophical dimensions, prevailing understanding, definition and its application in disaster theory and practice (Manyena, 2009). Tobin (1999) argues the 'disaster resilience' concept has been implemented at practice level since 1970s without a prevailing understanding at the theoretical level. However, the concept of disaster resilience often focuses on community. Literature that shows an 'understanding of vulnerability' (Burton et al, 1993; O'Brien et al., 2008) may be replaced by an 'understanding of resilience' for a better clarity of hazard and disaster studies. UNISDR (2009b: 24) define resilience from a community point of view:

> "The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structure and functions."

The concept of disaster resilience may incorporate both external disaster management initiatives and internal coping mechanisms to cope with stresses and shocks (Adger, 2000; Folke, 2006; Manyena et al., 2011; Aldrich, 2012; Jones et al., 2013; Zebrowski, 2013). The Hyogo Framework of Action 2005-2015 (HFA) has initiated a strategic and systemic approach to building disaster resilience (UNISDR, 2007, 2013). Furthermore, resilience driven DRR can accelerate to achieve sustainable development (Manyena et al., 2011; Jones et al., 2013). Thus, community-based disaster resilience focuses on enhancing community capacity to dealing with disasters in changing environments.

2.7 Community-based or local level approach: A community engagement perspective

"Community-based" is a commonly used term both in research and practice in DRR and CCA. Community-based disaster risk reduction (CBDRR) or community-based disaster risk management (CBDRM) and community-based adaptation (CBA) are terms given to disaster and climate change oriented programmes and projects at community level. Maskrey (2011) argues that in many cases CBDRM failed to ensure community participation in decision making processes but offered skill development opportunities for local governments, so might be more appropriately termed local level disaster risk management (LLDRM). He also adds that LLDRM approaches are primarily sustained on partnerships between local communities and local governments and NGOs while CBDRM initiatives often attract the support of national and local governments. Apart from their mutual supportive prospect (ibid.), community-based approaches are more common in Asian countries (Lavell, 2005, 2009; UNISDR, 2007), particularly in Bangladesh (CDMP, 2015b; CPP/GoB, 2015a). In view of this, the present study describes the national and local government functions as local level approaches while both collective and individual actions within a community are considered as community-based initiatives. Thus, the study examines how "community-based" labelled external interventions are implemented and how the communities respond in terms of their participation in decision making processes and partnerships with other stakeholders working at community or local level.

The concept of community engagement shares similarities with other terminologies such as "community participation" (Korten, 1980; Chambers, 1983, 1997; Castells, 1984; Blackburn and Holland, 1998), "community involvement" (Collins et al., 2009) and "community inclusiveness" (Ayers, 2010). The appeal of participation is based on the rationale of participatory approaches involving individuals and communities in decision-making processes that influence them to decide on their needs, resulting more widely in people-friendly interventions, and more efficient and sustainable outcomes (Chambers, 1983; Cornwall, 2002). More recently, this logic of participation as engagement has been incorporated in environmental policy-making in general, and climate change adaptation in particular (Few et al., 2007; Tompkins et al., 2008; Dodman and Mitlin, 2011). In the community-based adaptation perspective, the contextual multiple dimensional factors (i.e. environmental, economic, political and social) are needed to address the prevailing understanding of social vulnerability to

environmental hazards and disasters. Thus, community engagement in the processes of local level intervention in general and decision-making in particular informs as to why communities are vulnerable; how they experience vulnerability; how they cope with current disaster risks; and what changes could assist them in adapting to future climatic risks.

Community engagement in local level intervention provides the opportunities to understand local knowledge, experience and practice to identify problematic participatory processes (Nelson and Wright, 1995; Leal and Opp, 1998; Cornwall, 2000; Mohan and Stokke, 2000; Cooke and Kothari, 2001; Few et al., 2007). Nelson and Wright (1995) criticise the methods of participatory practices arguing that they should be improved for upcoming challenges. However, the more complex issue in these circumstances is the impact of politics within participatory processes (Mohan and Stokke, 2000; Cooke and Kothari, 2001; Williams, 2004). These divergent politics across scales influence change in the policy and practice required for integrating DRR and CCA in favour of wider development processes in Bangladesh. It is expected that the present study can act as one of the initial steps in addressing the lack of research on this subject matter and establish a platform for future researchers to understand how and why DRR is central for adapting to climate change in the rural Bangladesh context.

2.8 Summary

In summary, this chapter has reviewed the core concept of DRR and CCA, and how these two realms are linked to risk and vulnerability. The range of definitions and theoretical perspectives of these two components and their associate elements emphasises the need to understand the complexity of reducing climate change impacts and disaster risks in the developing world context. This chapter also critically examined how there is a lack of empirical evidence in favour of conceptual ideas and models in this discipline leading to misconceptions in understanding the real problems at local level and their appropriate solutions. Following on from this reconstruction of DRR and CCA the next chapter more specifically scrutinises the case of Bangladesh in further detail.

Chapter Three

The geographical focus of climate change and disaster risk reduction in Bangladesh

CHAPTER THREE

The Geographical focus of climate change and disaster risk reduction in Bangladesh

3.1 Introduction

Bangladesh is one of the most disaster prone countries in the world due to its geographical location and unique monsoon climatic condition (IFRC, 2014). However, the country is also well-known for its role model in disaster management particularly cyclone preparedness (CPP/GoB, 2015a) and people's indigenous knowledge of coping with floods (Brammer, 2004). This chapter studies the existing literature of Bangladesh as the study area of this thesis and in terms of how natural hazards, disasters and vulnerabilities are interlinked there in the climate change context. Further, the chapter focuses on how local people cope with disasters using their inherited knowledge and experiences, and how external stakeholders assist them when they are exposed to climatic extreme events. To explore the initiatives of DRR and CCA the chapter highlights not only the long history of disaster management by the government and other organisations including NGOs but also the present trend of trying to addressing both environmental disasters and climate change in tandem.

3.2 Hazards, disasters and vulnerability in a changing environment

To understand hazards, disasters and vulnerability in Bangladesh it is important to know how hazards, disasters and vulnerability are interlinked other than through the added issue of climate change. This can then be visited in the light of evidence of observed climate change impacts and scientific projections for the future. It is then also possible to discuss how climate change influences the relationship of hazards, disasters and vulnerability.

One reason why Bangladesh is one of the most disaster prone countries in the world is its geographical location between the Himalaya and the Bay of Bengal, whereby the typical 'monsoon' climatic condition makes the country vulnerable to environmental hazards (Nizamuddin, 2001). Tropical cyclones, floods, droughts and river bank erosion are the major natural hazards of the country.

3.2.1 Floods

In Bangladesh, the geographical distribution of flood risk is heavily concentrated in the basins of three major rivers: the Padma (Ganges), the Jamuna (Brahmaputra) and the Meghna (Figure 3.1). The country is characterised by the flat terrain of alluvial soil with an intricate system of over 230 rivers. About 60 percent of the country is flood prone while 25 percent of land is inundated by floodwater during monsoon period in a normal year (Khan, 1998). Serious floods occur, on average, every 3-5 years and catastrophic floods occur at intervals of about 10-20 years such as those of 1974, 1987, 1988, 1998 and 2004 (Brammer, 2004; Biswas, 2005).

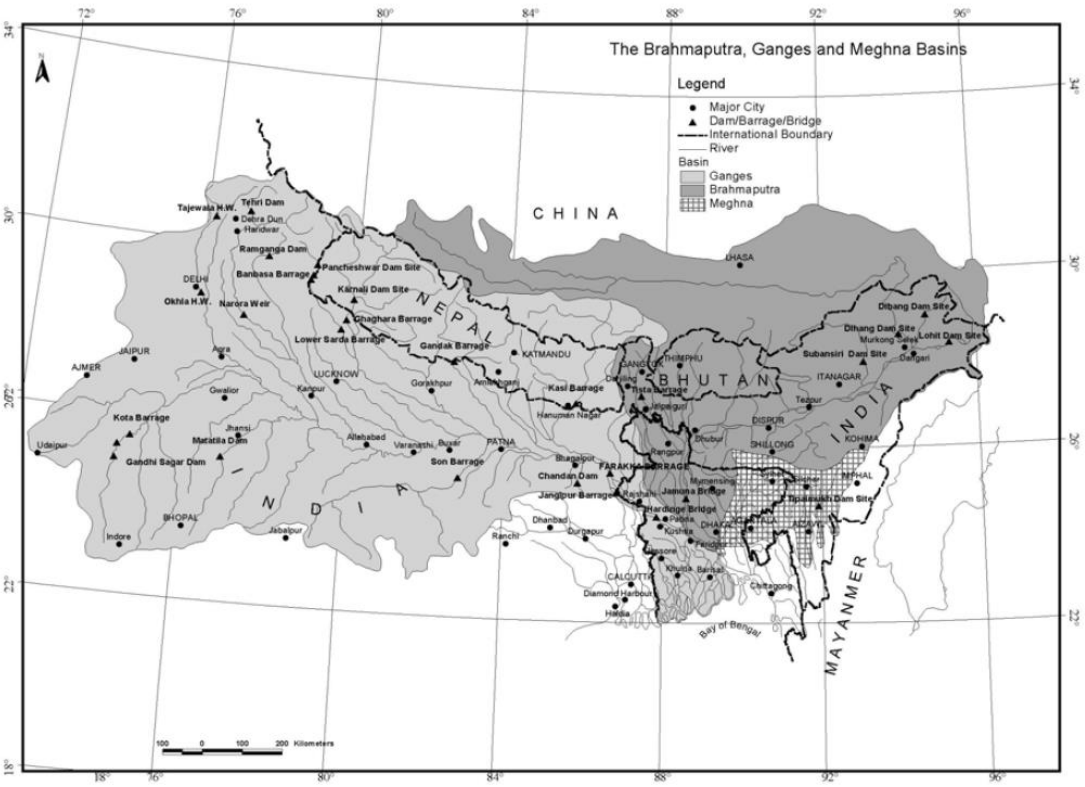


Figure 3.1 | Ganges-Brahmaputra-Meghna (GBM) catchment area

(Source: WARPO-Halcrow, 2004)

Major natural factors that cause floods in Bangladesh include stream carrying flows that are in excess of the transporting capacity within their banks. This occurs with a synchronisation of heavy rainfall with river as well as upland floods with high tides (Khalequzzaman, 1994; Shahjahan, 1998; Siddique and Chowdhury, 2000). Deforestation and drainage congestion due to uncoordinated development activities are the two major anthropogenic factors contributing to floods in Bangladesh

(Siddique and Chowdhury, 2000). However, Brammer (2004) emphasised that sudden breaching of an embankment, 'public cuts' in embankments, and failure of a major dam or barrage are common human-induced factors causing flooding. Ahmed and Mirza (2000) argue that existence of polders in the coast increases the intensity of coastal floods. Considering these natural and human-made factors, floods in Bangladesh can be classified under four main types: flash floods, river floods, rainwater floods and storm surge induced coastal floods (Ahmad et al., 1994, 2000; Alam et al., 1998; Brammer, 2004). In terms of timing and duration, floods can be divided by three types – early floods, normal floods and late floods (Mohammad, 2009).

Flash floods usually begin in rivers of piedmont areas during the pre-monsoon months of April and May causing extensive damage to crops (i.e. *Boro* rice), particularly in *Haor* areas (Ahmed, 2006; Khan et al., 2012; Sumon and Islam, 2013). Heavy rainfall occurs over the floodplains and terraced areas during both the pre-monsoon and monsoon periods. For example, the severe 1987 floods were directly resulting from excessive rainfall (Khalequzzaman, 1994). However, glacier-melt in the high Himalaya and intense monsoon rainfall over the Ganges-Brahmaputra-Meghna catchment area are the main two causes for the occurrence of normal river floods in Bangladesh during monsoon periods (Ahmed, 2006). Tidal surges are the main cause for coastal floods and are associated with cyclonic events (detailed in Section 3.2.4). Floods in Bangladesh are also closely interlinked with two other major hydrological hazards –river bank and coastal erosion and droughts.

3.2.2 River bank and coastal erosion

River ban and coastal erosion is a major natural hazard in the lives of the Bangladeshis, which is observed in only a few countries in the world such as northeast region of India (Rahman, 1986, 1991). River bank erosion is caused by the river channel shifting, the creation of new channels during floods, bank sprawling due to undercutting, and local scour from turbulence caused by obstacles (Ahmed, 2006; Rahman, 2010). According to the geomorphological time scale, soil formation processes in major parts of the country particularly in active zones of the three river basins are new (Brammer, 2004).

Usually river bank erosion occurs when flood water has gone down. Erosion and siltation are two geomorphological interrelated processes happening in the same time (Baqee, 1998). When erosion occurs on one bank of a river, siltation often takes place on the other side of the river (Rahman, 1991; Baqee, 1998). Satellite data shows that Bangladesh lost 106,300 hectares of land between 1982 and 1992 due to river bank erosion at the GBM catchment area while it gained only 19,300 hectares (Ahmed, 2006). It is also observed in some cases particularly in normal flood years that impacts of river bank erosion is more severe than the impacts of floods (Rahman, 1991).

3.2.3 Droughts

Droughts in Bangladesh are often referred to as hydrological droughts related with a 'low flood' situation in river basin areas (Wisner et al., 2004). However, the driest part of the country 'High Barind Tract' is prone to droughts due to unavailability of necessary groundwater and rainfall (Riches, 2008). In addition, Ahmed (2006) argues that drought in Bangladesh is primarily an agricultural phenomenon that affects both the plant growth and crop production due to insufficient moisture stored in soil. In the northern Brahmaputra-Jamuna River basin, seasonal and spatial pre-famine conditions occur regularly due to a lack of local livelihood opportunities (Elahi and Ara, 2008). The local people term this particular situation as *Monga* which is well-established as a concept with wider resonance in the development field (Shamsuddin et al., 2006; Elahi and Ara, 2008; Sultana, 2010; Ansari, 2013). Mirza and Paul (1992) reported that drought occurred 19 times between 1960 and 1991. Very severe droughts hit the country in 1951, 1961, 1975, 1979, 1981, 1982, 1984, 1989, and 1995 (Ahmed, 2006).

3.2.4 Tropical cyclones

The disaster literature of the country shows that tropical cyclone is the main hazard responsible for extensive human fatalities. Nicholls et al. (1995) claimed that 42 percent of total deaths associated with cyclones have occurred in Bangladesh over the last two centuries. Like floods, the geography of the coastline of the country is prone to tropical extreme wind and tidal surges. Although the North Indian Ocean including the Bay of Bengal is an inactive tropical cyclone basin compared to Northwestern and the Northeast Pacific Ocean and North Atlantic Ocean, many of the deadliest cyclones have formed and then landfall on the Bangladeshi coast (Bryant, 2005).

The cyclones of 1876, 1919, 1961, 1963, 1965, 1970, 1985, 1988, 1991, 1994, 1995, 1997, 2007 and 2009 were of a particularly severe nature (DDM/GoB, 2013a). In November 1970, when cyclone Bhola hit on the Bangladeshi coast, at least 300,000 people died with damages of US$75 million (Wisner et al., 2004). DDM/GoB (2013a) describes how on 29 April 1991, the southeast coast of Bangladesh was again struck by cyclone Gorky that killed at least 140,000 people and made homeless up to 10 million. In recent times, cyclone Sidr hit on the southwest coast of Bangladesh on 15 November 2007. The cyclone was also severe in nature and cost 3,406 lives (ibid.). The cyclone hit hardest on the south-central region including Barguna, Bagerhat, Patuakhali and Jhalokathi districts destroying 60-70 percent of homes (BBC, 2007). Furthermore, on 25 May 2009, cyclone Aila hit on the West Bengal coast near the international border between Bangladesh and India and caused 325 deaths in Bangladesh (Roy et al., 2009), though the official figure is 190 (DDM/GoB, 2013b). However, economic losses were very high in the later event and 200,000 people were displaced even after five months Aila hit (UN-HABITAT and IFRC, 2010).

3.2.5 Scientific projections of climate change and climate variability

Bangladesh is one of the most vulnerable countries in the world to climate change and climate variability despite its contribution to carbon emissions being negligible (IPCC, 2007). This section firstly discusses the scientific projections of climate change most relevant to Bangladesh and then explores its sectoral impacts. Scientific projections and modelling suggest how the climatic factors such as rainfall, temperature and sea level rise have already changed since a few decades ago and will continue to vary over the next few decades in the country (Rahman et al., 2012).

Ahmed and Alam (1998) project temperature will increase by 1.3°C and 2.6°C for two projection years, 2030 and 2075, respectively. They also find there will be higher variations in temperature during winter months than monsoon months. GoB (2009a) projects climate change will accelerate the conditions of heavier and more erratic rainfall in the central river basins of the country during the monsoon resulting in higher river flows, incread river bank erosion and sedimentation in riverbeds leading to drainage congestion and waterlogging. The analysis of Ahmed and Alam (1998) is that monsoon rainfall will increase by 12 and 27 percent by the year 2030 and 2075, respectively. The frequency and severity of tropical cyclones will be increased in the Bay of Bengal leading to more damage in the coastal belt (GoB, 2009a). It has been

projected that more than 20 million of coastal Bangladeshis live with high threats from sea level rise and saline water intrusion resulting in forced displacement (ibid.).

3.2.6 Projected spatial and sectoral impacts of climate change

This subsection evaluates the sectoral impacts of climate change including water, public health, ecosystems, agriculture and food security, fisheries, livelihoods, human settlements, infrastructure and tourism. These impacts are determined by exposure to extreme events and social vulnerability.

Bangladesh will suffer from non-availability of drinking water and irrigation water for agriculture due to climate change (FAO, 2007). Further, literature focuses on how arsenic contamination in groundwater has already been widespread in Bangladesh being harmful to both human health and agriculture (Hassan et al., 2005). It is estimated that around 85 million people of the country live in highly arsenic contaminated zones. Recent evidence shows that disasters destroy available sources of drinking water. Cyclone Aila salinised ponds and rain-harvest chambers which are the main sources of drinking water at the coast. Climate change is a great risk for the public health of the country through its adverse impacts on food, air and water (CCC/GoB, 2008). Climate change induced increases in salinity will leave adverse effects on human health (Rahman et al., 2012). Change in the patterns of ill-health in the country due to salinity intrusion is another aspect that needs to be adequately addressed (Haque, 2006). Moreover, climate induced floods increase waterborne diseases such as diarrhoea and cholera.

Climate induced salinity intrusion towards inland areas is harmful to coastal forests including the Sunderbans and estuarine ecosystems, and may have a lasting effect on terrestrial ecosystems including wetlands (Islam and Gnauck, 2011). Besides, sea level rise will impact on the geo-physical pattern of estuarine islands and accelerate the alteration of those islands' ecology by waterlogging (Brammer, 2014). The land of Haor basin is unsecured, and changed patterns of flood threaten the richness of the ecosystem and livelihoods of local people (Sumon and Islam, 2013). Agricultural systems of the basin are also affected by climate change. Unexpected climate change induced flash floods damage Boro rice in the Haor basin which is directly associated with local livelihoods and food security (ibid.). The IPCC Fourth Assessment Report predicted that the production of rice and wheat of the country will decrease by 8 and

32 percent respectively by 2050 (IPCC, 2007). Furthermore, climate change hampers the fisheries sector through decreasing the favourable aquatic ecosystem for local fish and other fishery varieties. Changes in availability of river water and flow are transforming the natural breeding areas of hilsa fish, the national fish of the country, in both the Meghna and Padma rivers and their tributaries (Mohammed, 2013).

Particular vulnerable groups may be affected in specific ways. For example, climate change of this nature is set to obstruct livelihood diversification for disaster survivors, particularly the women belonging to widow headed households. Many wage labourers lost their jobs in the coastal belt because of reduced production resulting in uncontrolled use of saline water in shrimp farms (Paul and Vogl, 2011). Further, cyclone Aila triggered mobility due to sudden loss of livelihoods related to agricultural production including fisheries, poultry and shrimp and eventually made the informal job market more competitive in urban areas particularly in Dhaka (Mallick et al., 2011).

Human settlements in high risk disaster prone areas are more vulnerable to climate change which negatively impacts through increases in intensity and frequency of extreme events. Besides, coastal settlements are also high risk from the sea level rise and six to eight million people could be displaced and would have to be resettled primarily in insecured urban slums (GoB, 2009a). Furthermore, large numbers of coastal people will need to move to highly risky urban slums (UN-HABITAT, 2008). Recent disasters in Bangladesh damaged its infrastructure including road network, power grid, bridges, buildings including schools and colleges (IFRC, 2014). It is predicted that as climate change is expected to increase, extreme events with high and unexpected magnitude will intensify damage (IPCC, 2012). Finally, the tourism business in Kuakata and Sunderbans was hampered after Sidr and tour operators lost minimum 20 percent of the planned profit (New Age, 2008). The main tourist destination of the country is Cox's Bazar situated in a high climatic induced cyclone affected zone. Further, the only coral atoll Saint Martin's Island is at high risk of being affected by sea level rise (Brammer, 2014).

3.2.7 Dimensions of vulnerability to environmental disasters and climate change

There are a number of hydro-geological and socioeconomic factors that make Bangladesh highly exposed and vulnerable to environmental disasters and climate

change (Huq et al., 1998; Ahmed, 2006). These factors include its geographical location and low-lying deltaic topography, monsoons that drive its extreme climate variability, its high population density and poverty rate, and its majority rural population being dependent on climate sensitive agriculture (ibid.). There are four major dimensions of vulnerability (i.e. environmental, social, political and economic) may increase societal vulnerability to environmental disasters and climate change (Figure 3.2).

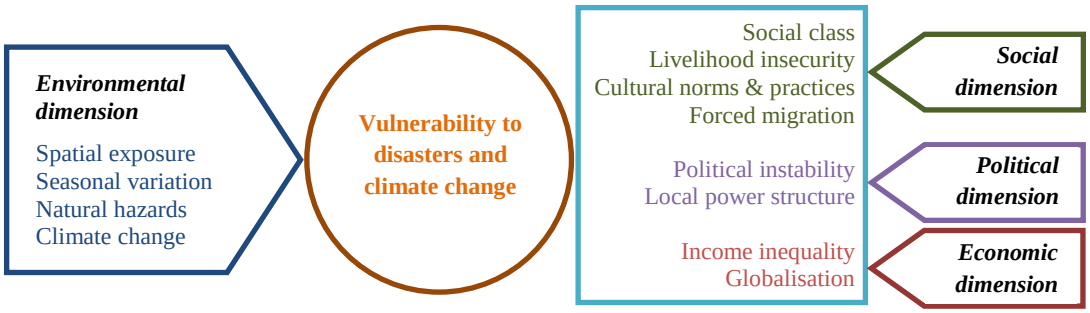


Figure 3.2 | Dimensions of vulnerability to environmental disasters and climate change

(Source: Author)

Environmental dimensions

Geomorphological phenomena play vital roles in determining the nature of weather and climatic events that make people exposed and vulnerable to disasters (Brammer, 2004). Low-lying river basins in Bangladesh are prone to floods whereas low-lying delta zones are prone to tropical cyclones (DDM/GoB, 2014a). The 'Sunderbans' situated at the southwest part of the country performed as a natural barrier during Sidr resulting in comparatively less deaths compared to previous events (Paul, 2009). Soil typology of river basins and coasts (i.e. sand and sandy loam) facilitates the river bank and coastal erosion (Brammer, 2014). Furthermore, apart from anthropogenic activities, water scarcity due to climate variability can cause long term drought conditions in the north-western region whereas the south-western Bangladesh observes salinity intrusion in the Ganges tidal zone (Riches et al., 2008). However, social, political and economic dimensions also influence the resultant outcomes of these environmental changes.

Social dimensions

The social dimensions include the influences of migration and displacement, social groups, health and education status, well-being and culture (IPCC, 2012). Cyclone affected people often migrate to major urban centres primarily to Dhaka for low wage informal jobs such as rickshaw-pulling (Ahmed et al., 2014). People who live in river char-lands are displaced many times in their lifetime due to river bank erosion rather than floods. They frequently move to new places, often new char-lands or embankments with their belongings including portable corrugated sheets of metal that comprise their houses (Haque and Zaman, 1989; Schmuck-Widmann, 1996; Baqee, 1998). Vulnerable social groups such as women, adolescent girls, children, senior citizens and people with disability are more affected by each kind of disaster (Aman, 1999; Chadwick et al., 1999). Children from the poorer families are often affected by floods in terms of it hampering their schooling during floods, and even after floods, due to their involvement in supplementary work with their parents such as colleting fuel and fodder (UNICEF Bangladesh, 2011). In addition, cultural dimension also plays a key role in exposure and vulnerability to disasters. Both in the past and presently many disaster victims of the country believe disaster to be an 'act of God'. This can make them reluctant to take proactive initiatives towards disaster management (Baqee, 1998).

Political dimensions

Lack of a strong institutional framework and good governance make the poor more vulnerable to disasters (Wisner et al., 2004; Collins, 2009). These political dimensions put them in a severe condition so they have no option but to migrate due to their poor access to government services (Schmuck-Widmann, 1996). Furthermore, the government of Bangladesh has primarily focused on rapid onset disasters such as floods and cyclones, whereas slow onset hazards such as droughts are given less attention from the government and media (Ahmed, 2006). However, recently government driven social safety net programmes target Monga affected areas due to NGOs and media exposure of Monga as a big political issue (Shamsuddin et al., 2006; Elahi and Ara, 2008; Riches, 2008; Sultana, 2010; Ansari, 2013).

Economic dimensions

The people with lower income and poor access to natural resources are more vulnerable to disasters (Brouwer et al., 2007) but it is the richer people who face financially more disaster losses and damages (Coppola, 2006). In terms of livelihoods, farmers are more exposed to disasters compared to those who are involved in off-farm activities (Hossain et al., 1987). Women are economically more vulnerable compared to their counterpart men due to their poor access to livelihood options (Mohammad, 2014). Mohammad adds that women in the Jamuna char-lands are primarily involved in post harvest activities and such opportunities are often offered to the women by food instead of cash.

3.2.8 Trends in natural hazards and disasters in a changing environment

It is predicted in many studies that climate change can increase the frequency and magnitude of natural hazards in Bangladesh (UNISDR, 2011; IPCC, 2012). Though there is no robust evidence that proves the relationship between climate change and tropical cyclones (IPCC, 2012), some recent studies argue that climate change might have the effect of increasing the frequency and intensity of tropical cyclones, particularly those observed in the last 35 years (Emanuel 2005; Webster et al., 2005; Bengtsson et al., 2006). Dasgupta et al. (2009) estimate that the total tidal surge induced inundation area will be increased by 69 percent in the vulnerable zones with more than three metres of inundation depth. This is a 14 percent increase in inundation depth in the vulnerable zone through climate change by 2050. Cyclone Sidr covered 26 percent of the vulnerable zone whilst a similar cyclone will be more intense with global warming and is likely to cover 43 percent of the vulnerable zone by 2050 (ibid.).

IPCC (2012) states there are a lack of literature on climate projections for river floods in Asia. However, apart from the impacts of upstream deforestation, it has been observed from scientific research that inundated areas increased by 8 to 16 percent in the Ganges and Jamuna basin for average flood events (year 2005) that are thought to be linked to climate change (GoB, 2010a; Practical Action, Undated). Haque et al. (2012) assumes climate change will increase the intensity of floods as well as the number of flooding days. Khan et al. (2012) inform that the frequency and intensity of flash floods in the Haor basin has been increased by increases in the rainfall in Shillong Plateau in India driven by a climate change modified monsoon system. Islam

also adds that flash floods occurred in mid-April 30-40 years ago while they hit 15 days earlier in recent years.

Climate change will increase the risk of droughts in the country, particularly in the northwestern region, albeit Haque et al. (2012) argues resource management issues are also playing a major role in increasing this risk rather than climate change. However, climate change impacts negatively on natural resources and drought victims who are primarily dependent on these resources (Ramamasy and Baas, 2007; Dey et al., 2011).

If the global mean sea level rises, the intensity of tropical cyclones, particularly in the Bay of Bengal will intensify (UNISDR, 2011). This will also increase the risk of salinity insurgence which will hamper coastal ecology including mangrove forests (Brammer, 2014). Recent literature suggests that sea level rise prolonged the floods of 1998 and 2004 (Ahmed, 2006).

3.3 Chronological development of disaster management in Bangladesh

The country developed its disaster management through having to deal with these major disaster events throughout the region's history. The disaster management approach of any one era is highly intertwined with the political situation of that era. Apart from some of the controversies from different periods, the capability of disaster management of Bangladesh is often well-known by the rest of the world (Faaland and Parkinson, 1976). It is important to this thesis that there is an understanding of the way disaster events and their management has occurred in varying political contexts to be able to assess current perspectives. The discussion of this section is therefore divided into five sub-headings so as to follow the major broad political eras of the country.

3.3.1 The Pre-Colonial Era (before 1757)

Before the colonial era, disaster management in this part of the world was not clearly recorded. However, an ancient book *Arthashasthra* (Science of Polity), written in Sanskrit, during the Maurya Empire (321–185 BC), mentions issues such as utilisation and conservation of natural resources (i.e. agriculture, animal husbandry and wildlife) and welfare (redistribution of wealth during a famine situation) (Kautilya, 1961; Tisdell, 2005). The book also describes the amount of rainfall in different places

indicating knowledge of rainfall measurement (Kautilya, 1961). During that time, many renowned astronomers predicted rain which helped the local farmers. It is commonly believed that Khona was a woman who lived in the ancient Bengal who made many predictions on meteorology and agro-meteorology and is remembered by the farmers of Bangladesh until the present days (Kautilya, 1961; Nath, 2008). However, this era is known as a 'welfare' period as evidence shows that most of the ancient kings and Z*amindars* (local landlords) especially the Pala kings (750–1174 AD) ensured peoples welfare by digging many tanks rising up over ancient Bengal to reduce water scarcity (Chakravarti, 2008). Later, during the *Sultani* Period (1213–1519), there were several embankments built by the Muslim rulers of the Medieval Bengal (Molla, 2011).

3.3.2 The British Colonial Era (1757 – 1947)

Though the colonial plan was to control and extract resources (Chadwick and Datta, 2000; Chadwick et al., 2001), the British colonial rulers, particularly after 1857, installed irrigation and flood control through human-cut canals in northern areas (presently part of Pakistan and north India). However, this colonial plan was primarily focused on 'agricultural development' rather than 'flood management' (Chadwick et al., 2001). In the (undivided) Bengal Presidency of British India, the colonial governments along with the local Zamindars built embankments according to their needs protecting their fertile lands from river floods and increasing revenue collection (Molla, 2011). Evidence shows that the embankment along the Gumti river in Tiperra (present Comilla district) was broke down by floods in 1786 and 1794. This included part of the flood control system that was introduced earlier (BWDB, 1998). In 1864, a severe flood broke some of the embankment of Rajshahi town and the town dwellers moved to the embankment with their livestock (ibid.). The poor construction of embankments failed to protect the local people from severe floods and they instead coped with it in their own way. When their houses were flooded and damaged, they stayed on bamboo rafts for days (ibid.). Nevertheless, after a major flood in northern Bengal in 1922, a flood committee was formed and a report was published in 1927 on the northern Bengal floods between 1870 and 1922 (Kholiquzzaman et al., 1998).

However, the most controversial evidence of the British legacy in the then Bengal were the failures of civil and military policy in controlling the Bengal famine of 1943 (Sen, 1982). Sen argues that the famine occurred as food was not transported and

distributed before the famine took place. This was because of the withdrawal of all country boats along the coast due to panic that the Japanese were going to attack there during World War II. However, these boats were the major transportation means for food, particularly rice from one place to another.

3.3.3 The Pakistani Colonial Era (1947 – 1971)

After partition in 1947, the newly created nation Pakistan had a deficit of experienced leadership and effective infrastructure for building the country, particularly in the resettling of refugees from India (Chaterjee, 1999). Moreover, the country was divided physically, culturally and economically. Meanwhile, the then East Pakistan experienced successive extreme floods in 1954 and 1955 (Rogers et al., 1989; Brammers, 1990, 2004) which influenced the government to take a structural solution for flood management. Apart from its poor policy and institutional framework, a master plan was prepared envisaging 58 Flood Control, Drainage and Irrigation (FCDI) projects principally focused on increased crop production through controlling floods, though many such projects were only completed in the late 1990s (Mirza, 1991; BWDB, 2012; Talukder and Shamsuddin, 2012). In this context, significant investment required for implementing these structural projects, and contemporary global geo-politics, influenced the country in allying with the American sphere of influence. Besides, the formation of East Pakistan Water and Power Development Authority (later Bangladesh Water Development Board), prescribed by the United Nations Krug Mission Report in 1956, influenced the concept of 'structural development' dominated by engineers (Rogers et al., 1989; Boyce, 1990; Custers, 1992; ISPAN, 1993; Chadwick and Datta, 2000). Later in 1964 the International Engineering Company Master Plan was formulated and still remains the most important publication for understanding flood management in Bangladesh through structural adjustments such as polders and embankments (Chadwick, 1999ab; Chadwick and Datta, 2000; Chadwick et al., 2001). Furthermore, the Standing Order for Cyclone of 1965 was issued by the government for handling tropical cyclones (GoB, 2010b).

During this period, the government adjusted itself to a modernisation approach to development in line with the green revolution and structural development policies driven by multinational agencies such as the United Nations, World Bank and Asian Development Bank (Berger, 2004; Picciotto and Anderson, 1997). During the

Pakistani colonial period both military and civil governments responded to disasters through a conventional 'relief and response' approach. Records show that after a cyclone hit on the Chittagong coast in 1958, the government provided house-building loans to the victims (Banglapedia, undated). The creation of the Ministry of Relief and Rehabilitation for East Bengal (later East Pakistan) was a milestone of the history of disaster management of the country for dealing disaster damages and losses.

A crucial criticism from this period is that this failed to take immediate action for assisting cyclone victims, such as in 1970 (Independent, Long Beach, California, 1971; Blood, 1988). The military government of that time produced a political turmoil in East Pakistan followed by an acceleration of the liberation movement of the country in the following year (Chaterjee, 1999).

3.3.4 The Post-Independent Era (1971 – 1990)

After independence in 1971, the main challenge of the first government of the country was the reconstruction of massive infrastructural damage incurred during the liberation war. The lesson learnt from the cyclone Bhola bound the government into establishing the Cyclone Preparedness Programme (CPP) for creating local volunteers in villages along the coast for working in cyclone preparedness and response. The government also gave emphasis to building cyclone shelters in the southern region including estuarine islands. Many NGOs including international partners were also involved in the development process of the newly created country.

The main criticism directed at the government was in failing to manage the famine of 1974 (Sen, 1982). As with the previous famine of 1943, food distribution and availability rather than food production was the main factor of the famine situation. The government controlled media did not disclose the crisis, though it is well-known that they were fully aware of the adverse situation (ibid.). Apart from other political failures, the famine contributed to destroying the popularity of the first post-independence government within four years, which was followed by the assassination of the founder of the country.

After 1975, the first military driven government was able to recover the people's trust and develop strong foreign relations, particularly with the western and the Muslim worlds, which created a favourable environment for development partners. The *"Khal Khonon Karmasuchi"* (Canal Digging Programme) was the main government

initiative for flood management towards agricultural development and food self-sufficiency (Chadwick and Datta, 2000; Sultana et al., 2008), as well as creating seasonal job opportunities for disaster victims through some social safety net programmes such as 'test relief' (TR), 'food for work' and 'cash for work'.

The next military government created the Directorate of Relief and Rehabilitation (DRR), Flood Forecasting and Warning Centre (FFWC) and the Environmental and Geographic Information System (EGIS) project (later CEGIS). In addition, the government issued the Emergency Standing Orders for Flood in 1984 and the Standing Orders for Cyclone in 1985 mentioning specific preparedness responsibilities of different ministries and government departments at all levels from national to union level (GoB, 2010b). During the late 1990s, lessons learnt from the repeated catastrophic floods of 1987 and 1988, the government shifted from the traditional 'relief and response' approach to a 'comprehensive disaster management' approach especially focusing on flood management. In 1994, the government modified the Ministry of Relief and Rehabilitation (MoRR) to the Ministry of Disaster Management and Relief (MoDMR).

A major controversial decision was taken by the government in 1989 by planning to implement an engineering approach for flood management that drove the mega-project Flood Action Plan (FAP) and paid less attention to community level adaptation and local people's agriculture-based livelihoods (Chadwick and Datta, 2000). From these developments it is clear that the post-independent era first continued an existing 'relief and response' approach and then later shifted to an 'integrated disaster management' approach. As the governments of the period were either highly one man focused autocrats or military driven, they dealt with disaster management through a strictly 'top-down' approach, which drove them to take disaster management as an 'engineering' matter to be addressed through establishing cyclone shelters, polders and river embankments.

In addition, the devastating impacts of the floods of 1987 and 1988 challenged the engineering-dominated approach of disaster management of the country, which forced huge numbers of marginalised people to live in high risk areas. Faaland and Parkinson (1976) predicted that the country would face a problem of achieving its national food security due to its increased population in future. Another major outcome of this era is

that the government considered disaster management as a part of wider development process, which allowed many NGOs and development partners to work in this field.

3.3.5 The Post-Democracy Era (after 1990)

After 1990, when the first democratic government was trying to implement the Flood Action Plan following the action plan prescribed by the previous government, the country experienced the devastating tropical cyclone of 1991 (later named as Gorky), the greatest since 1970. The cyclonic event had a major impact since community involvement in disaster management and the early warning of CPP volunteers and infrastructure of shelters was not yet reducing disaster risk. Until Cyclone Gorky, the then disaster management system rarely paid attention to women and children who were those mostly affected (Ikeda, 1996). However, the controversy of FAP and failure of saving people's lives in cyclone Gorky helped the government improve the Flood Plan Co-ordination Organisation's guidelines for people's participation, and rapidly shifted the agenda to a 'community' based disaster management approach and from a purely 'hard science' to 'soft science' approach (FPCO, 1993). The government established the Disaster Management Bureau (presently Disaster Management Department after incorporating it with the Department of Relief and Rehabilitation) in 1993 and rearranged CPP and developed a gender sensitive master plan of cyclone shelters (GoB, 2008). The government also planned to build 2,500 cyclone shelters and 'Green Belt' (afforestation programme) along the coast for reducing cyclone risk. In 2010, the government released the Standing Order in Disasters (SOD) for government officials regarding their duties and responsibilities in emergencies (DDM/GoB, 2012).

In 1998, the country experienced again another catastrophic flood and around 60 percent of land mass went under flood water. Lessons learnt from the flood helped shift the emphasis from one of managing 'disasters' to reducing 'disaster risks'. In 2004, a five year long large project namely Comprehensive Disaster Management Programme (CDMP) followed by CDMP II (2010-2015) was adopted to primarily implement prevention, mitigation and preparedness. Further, along with many other countries, Bangladesh adopted the HFA 2005-2015 and was particularly active in contributing to the Sendai Framework for Disaster Risk Reduction 2015-2030. Meanwhile, the country experienced another devastating flood in 2004 which also

taught the nation about how DRR initiatives should be implemented for dealing with disasters.

In 2007, cyclone Sidr hit the country causing extensive economic losses, though death tolls were considerably decreased compared to the last two catastrophic cyclones in 1970 and 1991 (DDM/GoB, 2013b). Though there were some additional factors, such as its overlap with a natural barrier (Sunderbans) and the physical characteristics of the event that helped to reduce death tolls (Paul, 2012), early warning and cyclone shelters played a vital role in these reductions. Analysts claimed that the flood of 2004 and Sidr were caused due to climate change (BCCT/GoB, 2014). Though there is no strong scientific evidence to back up this claim, it eventually attracted foreign governments and development partners to come forward, which helped the nation in making decisions about the need to mainstream CCA and DRR. The present government has allocated separate climate and disaster funds for implementing projects. Though the country has been dealing with disasters for decades, it recently approved its National Disaster Management Policy (GoB, 2012b).

Bangladesh has more than 3,000 cyclone and flood shelters in coastal and river belts (MoDMR/GoB, 2012). CPP has around 50,000 volunteers along the coast involved in disseminating early warning to remote places (CPP/GoB, 2015a). From the above discussion it is clearly understood that the period started with incorporating a comprehensive disaster management approach and later moved to implementing DRR and CCA into the development process. The period had been driven through an improved understanding of the human-environment relationship (Hewitt, 1983; Watts, 1983) and related social aspects, including advocacy for marginalised groups, specifically women, in disaster management (Hanchett, 1997; Chadwick et al., 1999; Hawkes and Hart, 2000; Coles and Wallace, 2005). The period from 2000 is in particular guided by a ‘human development’ approach at the nexus between disaster and development through strengthening institutional frameworks and improving skills of all actors in the disaster field including communities (Tobin and Montz, 1997; Quarantelli, 1998; Cutter, 2003; Pelling, 2003; Collins, 2009; Smith and Petley, 2009). The experience of the 1998 flood at national level and the United Nations Millennium Development Goals (MDGs) at international level helped the nation shift its disaster management policy from event- to community-centred strategies.

The NGO interventions at the grass root level through human development, ultimately targeting vulnerable groups and focusing on sustainable livelihoods and vulnerability reduction to disasters suppressed the engineering driven government approaches of disaster management (Tobin and Montz, 1997; Enarson and Morrow, 1998; Quarantelli, 1998; Twigg and Bhatt, 1998; Lewis, 1999; Höfer and Messerli, 2006; Enarson and Chakrabarti, 2009; Smith and Petley, 2009). One of the most outstanding achievements in this period is that many local NGOs, civic society and media are involved in proactive strategies including community-based awareness, relief work, disaster preparedness and response activities (Matin and Taher, 2001; Mitlin et al., 2007).

3.4 Actors for disaster risk reduction and climate change adaptation

There are many actors working for managing disasters and climate change in Bangladesh from national to local level. These actors include the national government, local governments, nongovernmental organisations (NGOs), private sector, civil society, community-based organisations (CBOs), development partners (i.e. multilateral and bilateral agencies), media, academic and research institutes, and the public.

3.4.1 National government

The national government of Bangladesh, officially called the Government of the People's Republic of Bangladesh (hereafter the government or GoB) is a unitary republic system, and the sole constitutional authority for maintaining administrative and financial tasks through policy-making, planning and implementing actions for all sectors including managing disasters and climate change. The government has the legal command to monitor other actors' activities. All foreign aid and grants including humanitarian relief go through the External Relation Division (ERD) under the Ministry of Finance. All NGOs need prior permission and registration from the government agencies such as NGO Affairs Bureau, Directorate of Social Services and Department of Women Affairs for implementing their services in any part of the country.

Significant progress has been made in disaster management in recent years. Bangladesh has a good operational framework – the Standing Orders on Disasters

(SOD) – which defines roles and responsibilities in the event of disaster, as well as the Disaster Management Act. Codifying government responsibilities in law will be part of the solution, but not the only part. Legal obligations are one thing; the capacity to meet them is quite another. There is currently a significant gap in capacity, particularly at the local government level. Under the new legal framework, local Disaster Management Committees (DMCs) will be key institutions with important responsibilities. However, in many of the most vulnerable areas DMC members still lack the basic skills and knowledge to fulfil their anticipated role. Bangladesh's management of disaster risks in a changing climate, the national systems for legislation, execution, policy formulation and implementation, financing and budget allocation, monitoring and evaluation are discussed in Section 3.5.

3.4.2 Local governments

There are three tiers of local government systems in rural Bangladesh with less executive power compared to the central government in relation to decision making, implementing and financing, though the constitution of the country gives ample legal authority to practice (CPD, 2002). These local governments (hereafter LG) are: *Zila Parishad* (District Council), *Upazila Parishad* (Sub-district Council) and *Union Parishad* (Union Council). For urban areas, LG institutes are city corporations for big cities and *Paurashava* (municipalities) for small towns. Figure 3.3 shows how the government implements its policies, plans and functions at ground level alongside different LG institutes. At district level, though there is an LG institute namely Zila Parishad, the government functions are done by different government departments through the coordination of the Deputy Commissioner (DC).

However, at Upazila level, government departments are responsible to Upazila Parishad for all their functions. At union level, many government departments execute their services under the supervision of their respective chief departmental officer at Upazila level. However, they are responsible to fulfil any queries by respective Union Parishad. Moreover, there is a special arrangement for Chittagong Hill Tracts comprising three hill districts namely Rangamati Hill District, Banderban Hill District and Khagrachhari Hill District. According to the Chittagong Hill Accord 1998, this region enjoys special benefits and autonomy in their decisions.

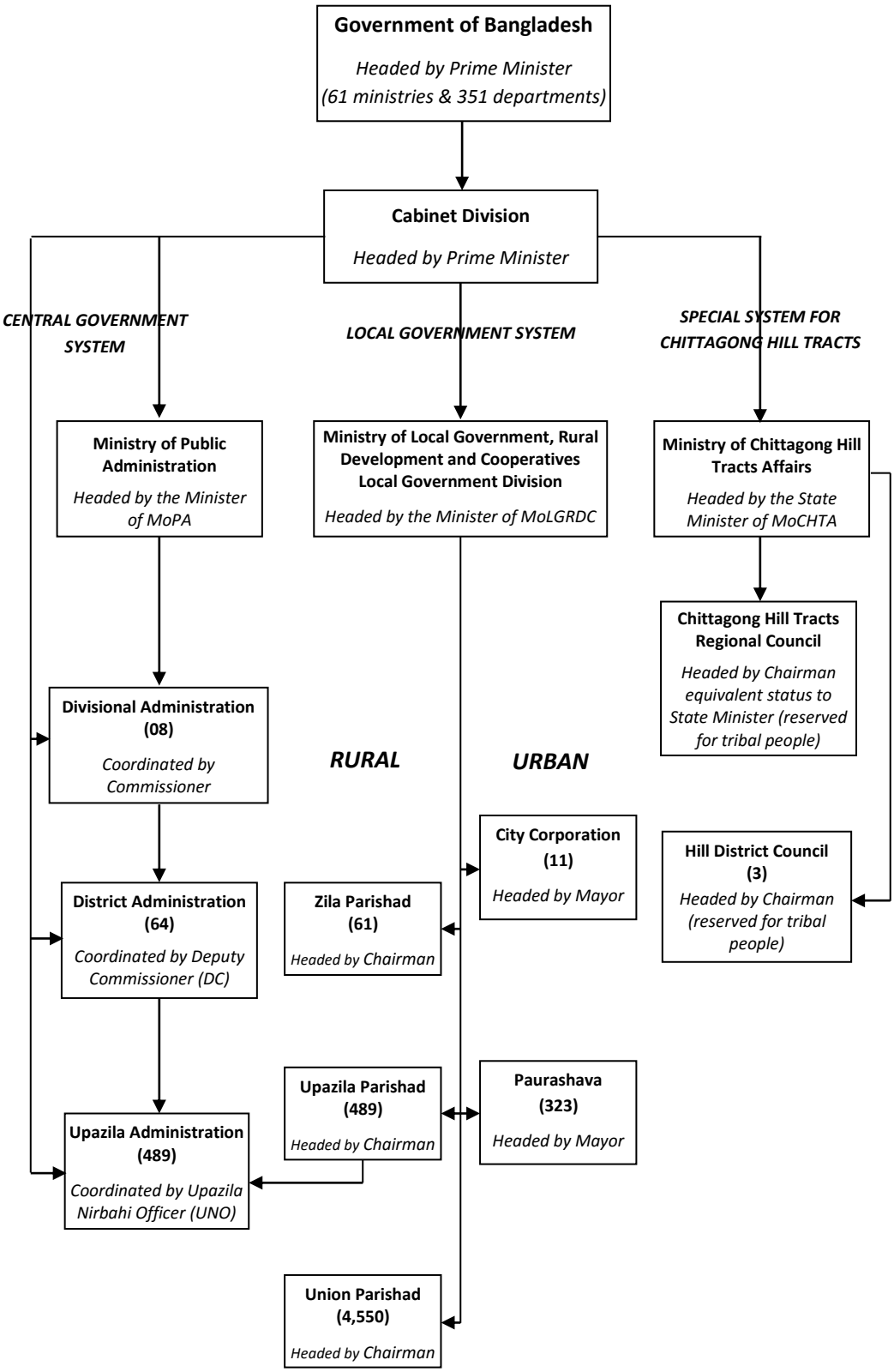


Figure 3.3 | Hierarchical system of local government institutes in Bangladesh

(Source: Author)

City Corporation

A city corporation is formed in a larger urban area in terms of both populations and area. There are 11 city corporations in Bangladesh – headed by an elected mayor and a number of councillors including one-third seats reserved for females only. The number of wards is varied between 27 (Sylhet and Comilla) and 56 (Dhaka South). According to the Clause 50 under the Local Government (City Corporation) Act 2009, there is a permanent committee for disaster management out of 14 committees (GoB, 2009b). According to the Act, the authority of a city corporation can take necessary actions for disaster management following the government policy and coordination with field administration. According the SOD (Clause 3.1), there should be a City Corporation Disaster Management Committee (CCDMC) which is chaired by the Mayor of the respective city corporation and comprised of all councillors and selected officers of the city corporation, representatives of different government departments and NGOs, and nominated personnel (GoB, 2010b). A CCDMC is responsible for implementing all actions for risk reduction and emergency response before, during and after a disaster event. However, all activities are done by closely tagging along with DDM.

Paurashava

A Paurashava (hereafter municipality) is formed in a small urban area. There are 323 municipalities in Bangladesh under three categories – Class A (number of municipalities – 142), Class B (number of municipalities – 101) and Class C (number of municipalities – 80) (LGED/GoB, 2015). A municipality is divided into numbers of wards (range 9 to 18). A municipality consists of an elected mayor and elected councillors (one councillor presents each ward). There are one-third of general wards reserved seats only for elected female councillors. The size of a municipality varies from 13 to 25 members. According to the Local Government (Paurashava) Act 2009, a municipality can form 10 permanent committees for monitoring its functions including a provision of creating a permanent committee for disaster management (GoB, 2009c). The Clause 47 under the Act mentions that municipalities will arrange necessary boats and equipment for flood protection, evacuating and assisting flood survivors, and the concerned Deputy Commissioner (DC) must do it according to his or her jurisdiction, if he or she thinks it is important. However, according the SOD (Clause 3.4), there should be a Paurashava Disaster Management Committee

(Paurashava DMC) which is chaired by the Mayor of the respective municipality and comprised by the all councillors and selected officers of the municipality, representatives of different government departments and NGOs, and nominated personnel. Paurashava DMC is responsible for implementing all actions for risk reduction and emergency response before, during and after a disaster event. However, all activities will be done in close coordination with District Disaster Management Committee (DDMC) (in case of category 'A' municipalities) or Upazila Disaster Management Committee (UzDMC) (in case of category 'B' and 'C' municipalities).

Zila Parishad

Zila Parishad (hereafter district council) is the highest tier of the LG system in Bangladesh. There are 61 district councils, each of them consists one chairman, 15 general members and five female members (reserved seats) who are elected by all representatives of city corporations, municipalities, upazila councils and union councils under the respective district. In reality, district councils have rarely been seen in a positive light because of the ill motives of the government and bureaucrats in all regimes (Nadiruzzaman, 2008). Until recent times, the government appointed a Deputy Secretary as the Chief Executive Officer of a district council who maintained all functionaries of district council making a close tie with district administration and the concerned ministries. However, at present all chairpersons of district councils are appointed by the government considering their close political tie with the ruling party. All Upazila chairmen are appointed as the member of their respective district council (GoB, 2010). There is the intention to have a permanent committee for monitoring and evaluating relief and disaster management, NGO activities and self-employment along with six permanent committees for other functions, though there is nothing mentioned directly regarding disaster management in the Zila Parishad Act 2000 (GoB, 2000). According to the SOD in 2010, DDMC is chaired by the DC of the respective district (GoB, 2010b). There is no room for the district council to be involved in the DDMC and its activities. However, the Chief Executive Officer of the district council is a member of the respective DDMC (GoB, 2000, 2010b).

Upazila Parishad

Upazila Parishad (hereafter Upazila council or UzP) is the immediate tier after district council was established during 1980s driven from the core concept of the 'Comilla

Model'[2] (BARD, 1983). According to the Upazila Parishad Act 1998, an UzP consists of one elected chairperson, two elected vice-chairpersons (male and female), all chairmen of the union councils and all mayors of municipalities under the jurisdiction of the concerned Upazila (GoB, 2009e). There are 28 government and statury departments at Upazila level (Appendix 1 for details). However, according to the Act, the government has handed over 17 departments including their activities, manpower and properties at Upazila level to the respective UzP (Table 3.1). The government appoints an Upazila Nirbahi (Executive) Officer (UNO) who coordinates with all government departments and functions at Upazila level and provides administrative support to the respective Upazila council. However, there are a few other government departments at the Upazila level which are not under the UzP but work in coordination with the respective UNO.

Table 3.1 | Different government departments at Upazila level

Description	**Number of departments at Upazila level**
Government departments under the direct supervision of Upazila Parishad	17
Other departments at Upazila level directly controlled by the [central] government (GoB)	10
Election Commission, Bangladesh (a statutory body but not part of the government)	1
Total	**28**

(Source: Author)

According to the revised SOD in 2010, there is to be an UzDMC in every Upazila chaired and co-chaired by the UzP Chairman and UNO respectively. The committee consists of the executive head of 18 government departments, the mayor of the Upazila municipalities, two UzP vice-chairmen, all UP chairmen, and 14-16 other selected members. The Project Implementation Officer (PIO) of the respective Upazila acts as the member-secretary of the committee. The local Member of Parliament (MP) acts as the advisor of the respective UzDMC.

[2] The model was developed by Dr Akhtar Hameed Khan in 1959 based at former Pakistan Academy for Rural Development (presently Bangladesh Academy for Rural Development) in Comilla and identified the problems and constrains for agricultural and rural development through learning from the daily life of the rural poor. The model consists of four components primarily focusing on Thana (Upazila) – Thana training and development centre (TTDC), public works programme (i.e. roads and embankments), small scale irrigation programme and two-tier cooperative system (BARD, 1983).

UzDMCs are responsible for implementing all actions for risk reduction and emergency response following the guidelines of SOD in their respective Upazilas before, during and after a disaster event. An UzDMC regularly assists respective Union and Paurashava DMCs (in case of category 'B' and 'C' municipalities) in every step of risk reduction and emergency response (GoB, 2010b). All activities will be done in close association with the DDMC. The chairman has a role in site selection, land development and beneficiaries' selection under the Ashrayan Project[3] (GoB, 2015b).

Union Parishad

Union Parishad (hereafter union council or UP) is the oldest and lowest tier of the local government system in Bangladesh. There are 4,480 Union Parishads; each of them consists of 13 elected representatives including one Chairperson, nine Ward Members (General) and three Female Ward Members (Reserved) (GoB, 2009d). According to the Local Government (Union Parishad) Act 2009, there is to be a sub-committee for emergency response to epidemic and natural disasters at ward level (ibid.). In Clause 17, the national government can reform a union if it has been reshaped by river bank erosion and natural disasters. There is a permanent committee for social welfare and disaster management out of 13 committees in every union council.

According to the Clause 3.5 under the SOD, there should be a Union Disaster Management Committee (hereafter UDMC) chaired by respective UP chairman. The committee consists of 12 UP Members, seven government officials working at union level and 15 other nominated members. The Secretary to the respective UP acts as the Member-Secretary of the committee. UDMCs are responsible for implementing all actions for risk reduction and emergency response in their respective unions before, during and after a disaster event. However, all activities will be done by closely tagging with respective UzDMC.

[3] *Ashrayan* (shelter) Project has been implemented directly supervised by the Prime Minister under her Office since 1997. The overall objective of the Project is to alleviate poverty of the landless and homeless people through providing shelters and human resource development activities. The aim of the project is to improve the standard of living ensuring basic education, health care and skill development on income generating activities of the landless, homeless, distress and rootless people. (GoB, 2015b)

3.4.3 Nongovernmental organisations

Nongovernmental organisations (hereafter NGO/ NGOs) have been playing vital roles in the development process including disaster management in Bangladesh since its independence. Many international organisations were involved in reconstruction activities of the country for recovering from the extensive damage during the nine-month long liberation war in 1971. However, NGO activities mainly appeared in the 1980s and later (GoB, 2014c). Many local NGOs were established over the country particularly in remote areas. According to the NGO Affairs Bureau, there are more than 3,000 registered NGOs working in different fields.

In the field of disaster management, NGOs indicate that they work at grass root level for strengthening people's capacity. Evidence shows that NGO activities primarily focus on the post-disaster phase by providing technical and material support for safe construction, revival of educational institutions and restoration of the means of a livelihood, also assisting the government in monitoring the pace of implementation for various reconstruction and recovery programmes (Leaf, 1997; Begum, 2004). On the other hand, NGOs are often found to act as active service contractors rather than focussing more on improvement at the real service end (MRA, 2009). However, the local NGO has also put a strong emphasis on involving communities in challenging traditional beliefs, resource constraints, lack of communication and coordination and lack of knowledge about climate change (Christensen et al., 2012).

Some local NGOs recently involve some politically sensitive groups in disaster management processes. Alam et al. (2010) argues that as 95 percent of the students of the *Madrasahs* (religious schools) in the southwestern areas of Bangladesh are coming from poor families. Since the poor are most vulnerable to climate change, he argues that these students (and their teachers) need to be included in any initiative taken to build awareness about CCA in those communities. He also criticises the roles of INGOs as according to him these organisations approach disaster affected third world countries with an 'event management' mindset (i.e. when a disaster strikes a poor country INGOs arrive there). The role played by the NGOs in Bangladesh is the role of a contractor for the INGOs' projects (ibid.). He claims that there has to be major changes in these mindsets and prevalent practices if the practitioners intend to effectively and efficiently confront the impacts of climate change.

Local NGOs are trying to focus on some climate change related initiatives that are easy to implement and attract more external funds. Community Radio, for example, can play a very important role in disaster management. Solar energy, another initiative, can be an alternative and sustainable source of energy for the people living in the disaster prone areas. Rupantor, a local NGO primarily based in southwestern region of the country, for example, had chosen theatre as an adaptation tool through which the children and youth would learn about climate change and eventually convey the messages throughout their society (ibid.).

NGO's are increasingly informed that community-based adaptation for livelihoods and food security is a requisite for sustainable outcomes of CCA initiatives (Christensen et al., 2012). In some cases, NGOs directly assist actions from the government. Evidence shows that Dwip Unnayan Santha (Island Development Organisation), a local NGO working in the coastal islands, assists the government in allotting the land inside the embankment to the people (around 5,000 acres) (Alam et al., 2010). They claim that the rights of the local people over that land are now established in some of those coastal islands and the people are taking good care of the embankment. The scientists of Bangladesh Rice Research Institute (BRRI) developed 15 high yielding rice varieties with drought, flood, submerged and saline tolerance and promoted farmers with the support of the Department of Agricultural Extension (DAE) under the Ministry of Agriculture (BRRI, 2015). It is argued that how off cyclone season products such as ground nut, water melon and soya bean production is encouraged through seasonal loan support programmes (ibid.).

Vasta (2005) indicates that NGOs specialising in microfinance have been extremely successful in reaching poor rural people in Bangladesh. Most have directed their lending towards landless households or those with less than 0.2 ha of land, and have largely excluded small land-holder farmers. Such a selection process of vulnerable people is also happening in the case of selecting beneficiaries of development and social safety net projects implemented by the government and development partners.

3.4.4 Development partners

Development partners are also actively participating in the development process in Bangladesh. Both the government and local NGOs implement their services based on development partners' prescriptions in the field of disaster management and climate

change. These development partners include multilateral (e.g. the United Nations and its organisations, World Bank, Asian Development Bank), bilateral (e.g. DFID, JICA, USAID, AUSAID, DANIDA), INGOs (e.g. Save the Children, Oxfam International, CARE International) and faith-based organisations (e.g. Christian Aid, Caritas, Muslim Aid, Islamic Relief).

The International Fund for Agricultural Development (IFAD) and the Government of Bangladesh joined forces with the Palli Karma-Sahayak Foundation (Rural Employment Generation Foundation) (PKSF), one of the world's leading independent microfinance institutions. Together, they pioneered a new approach to delivering financial services to small and marginal farmers in the country.

3.4.5 Media

Both print and electronic media are involved in disaster management processes in Bangladesh though they are often criticised for their highly reactive or sensationalised role in the aftermath of a disaster event (Iqbal et al., 2014). However, there are also some more in-depth TV and radio programmes broadcast and critical reports published in dailies and magazines addressing disaster management and climate change issues. These often include extended contributions from academics and other analysts.

3.4.6 Research and educational institutions

There are a substantial number of universities and research institutions in Bangladesh conducting academic programmes and research projects on disaster management. Since 2005, there has been a significant increase in higher education particularly at postgraduate level (Table 3.2) with many individuals and universities carrying out research activities on disaster management since the country were independent in 1971. Appendix 2 presents the detailed list of the universities and research organisations in Bangladesh addressing disaster management and climate change issues.

Table 3.2 | Bangladeshi universities and research institutes and their academic programmes and activities addressing disaster management and climate change issues

	Public universities		**Private universities**		**Govt. research institutes**	**Research based NGOs**
	No. of universities	*No. of depts.*	*No. of universities*	*No. of depts.*		
Total number	20	51	8	10	18	5
Bachelor programmes	*5*	*6*	*1*	*1*	-	-
PGD programmes	*3*	*4*	*1*	*1*	-	-
Masters programmes	*4*	*11*	*2*	*2*	-	-
Course modules	*12*	*16*	*5*	*6*	-	-
MPhil and PhD	*11*	*29*	-	-	-	-
Research only	*17*	*46*	*7*	*9*	*16*	*4*
Research and training	*3*	*5*	*1*	*1*	*2*	*1*

(Source: Author)

3.4.7 Public

Local people of Bangladesh have been coping with natural disasters for decades and longer through their own indigenous know-how (Christensen et al., 2012). Evidence shows that in the past there were indigenously developed warning mechanisms such as making forecasts by feeling the temperature of the water or wind flow directions. Farmers of Bangladesh have their own anciently derived crop calendar which may be altered depending on the magnitude of flooding useful for coping with disaster losses and damages. A short duration rice variety, for example, has been identified and farmers of Haor region have positively responded to cultivate short duration Boro rice (CCC/GoB, 2009). Climate change is however hampering their crop calendar. Erratic rainfall patterns will cause confusions in the farmers' decision making in the near future (ibid.). The community has its unique roles in climate smart disaster risk management. People's initiatives are usually more sustainable, whereas the actions of the external agents create conflicts and ambiguities. However, the development agencies ought to play a supportive (people-centred) and proactive role.

3.5 National systems for disaster risk reduction and climate change adaptation

Disaster management through governmental mechanisms has been considered as a key development issue of the country since the 1950s. There was a separate department for relief and rehabilitation in the then East Pakistan. After that until recent times, the department, which became a ministry after independence in 1971, was renamed and restructured with different aims and functions but encompassing the concept of disaster management. On 13th September 2012, the government divided the Ministry of Food and Disaster Management into two separate ministries and the later portion was renamed as the Ministry of Disaster Management and Relief (GoB, 2012b). The vision of the government for disaster management is "… to reduce the risk of people, especially the poor and the disadvantaged, from the effects of natural, environment and human induced hazards to a manageable and acceptable humanitarian level and to have in place an efficient emergency response management system" (ibid.). The government has decided to drive the national risk reduction reform strategy as a priority national agenda. The mission of the government is: "to achieve a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of communities to hazards" (GoB, 2014c: 4).

There are three types of programmes addressing disaster management, namely social safety net, humanitarian assistance and disaster risk reduction programmes (ibid.). Most of the programmes and projects are financed internally through the Annual Development Programmes (ADPs) whereas others are funded by development partners and foreign countries through aid or grants. Test Relief (TR), Food for Work (FFW) and Employment Generation Program for the Hardcore Poor (EGPP) are the main three government programmes under social safety net. The main objective of TR and FFW is to reduce overall disaster risk through rural infrastructure development and maintenance (GoB, 2014ab). Another objective of those programmes is to create employment opportunities, supply food grains for ensuring food security and create positive impact on poverty eradication for social and food security of the rural poor in reducing disaster risk and adapting to climate change. In Bangladesh, 31.5 percent of people live under the poverty line (BBS, 2014), one-third of these as extreme poor. The government and development partners help them to secure their lives and livelihoods during and after disaster events and the lean periods in agriculture sector.

There are many humanitarian assistance programmes in Bangladesh (GoB, 2014c) including the following:

1. Vulnerable group feeding (VGF)
2. Food grain assistance
3. Wave corrugated sheet assistance
4. Cash assistance
5. Winter cloth assistance
6. Cash assistance for housing

The Government of Bangladesh Disaster Management Act was published on 24 September, 2012 (GoB, 2012a). There is a separate department namely the Disaster Management Department that sits under the ministry. Furthermore, the Cyclone Preparedness Programme (CPP) is a semi-government organisation working for cyclone preparedness and response along coastal Bangladesh. The Comprehensive Disaster Management Programme (CDMP) is an extensive donor-funded programme recently conducted across the country.

3.5.1 Department of Disaster Management (DDM)

The Department of Disaster Management (DDM) was set up in November 2012 under the MoDMR following ratification of the Disaster Management Act 2012 (GoB, 2014c). The former Disaster Management Bureau (DMB) and Department of Relief and Rehabilitation (DRR) were merged into the new department including most objectives, mandates, functions of both departments (DDM/GoB, 2015). By law the Department has responsibilities to implement the Disaster Management Act by reducing disaster vulnerability through various risk reduction and emergency response activities including humanitarian assistance for enhancing the capacity of vulnerable groups and strengthening and coordinating programmes undertaken by government and NGOs. The department is also responsible for implementing the directions and recommendations of the government in connection with disaster management as well as the national disaster management principles and planning (GoB, 2014c). The DDM is headed by a Director General (a high government official often an Additional Secretary to the government) and focuses on networking and collaborating. It links to various ministries, departments and scientific, technical, research and academic institutions, development partners, UN agencies and NGOs within and outside the

government working on various aspects of disaster risk reduction and response management.

3.5.2 Cyclone Preparedness Programme (CPP)

After the severe cyclone in 1970, and at the request of the United Nations, the Cyclone Preparedness Programme (CPP) was established in 1972 with the help of the then League of Red Cross Societies (presently the International Federation of Red Cross and Red Crescent Societies) (CPP/GoB, 2015a). As a result, it appeared as a joint programme of the government and Bangladesh Red Crescent Society (BDRCS). Since then, it has been working in the field of disaster management in Bangladesh especially in cyclone early warning systems, search and rescue, evacuation, sheltering, first aid, relief distribution and rehabilitation activities. It has obtained a great name and fame all over the world for its well managed and motivated disaster management activities displaying a dedicated humanitarian spirit (UN, 2006). Now CPP is considered as one of the model programmes in the disaster management field in the world (IFRC, 2009). CPP gained the "Smith Tumsaroch Award 1998" for its outstanding performance in the disaster management field.

CPP is run by a Policy Committee headed by the Minister of the MoDMR and is administered by an Implementation Board headed by the Secretary of the same ministry. The CPP has 203 staff and 49,365 volunteers among which 16,455 are female volunteers. CPP has 3,291 units, 322 unions, 37 Upazilas of 13 coastal districts are the command area of including a Head Office in Dhaka and seven zonal offices (CPP/GoB, 2015b) (Figure 3.4). Each zonal office has some Upazila offices; each Upazila office has some unions; and each union has some units. In each unit, CPP has 15 volunteers for five groups: Warning Signal, Shelter, Rescue, First Aid and Relief (ibid.).

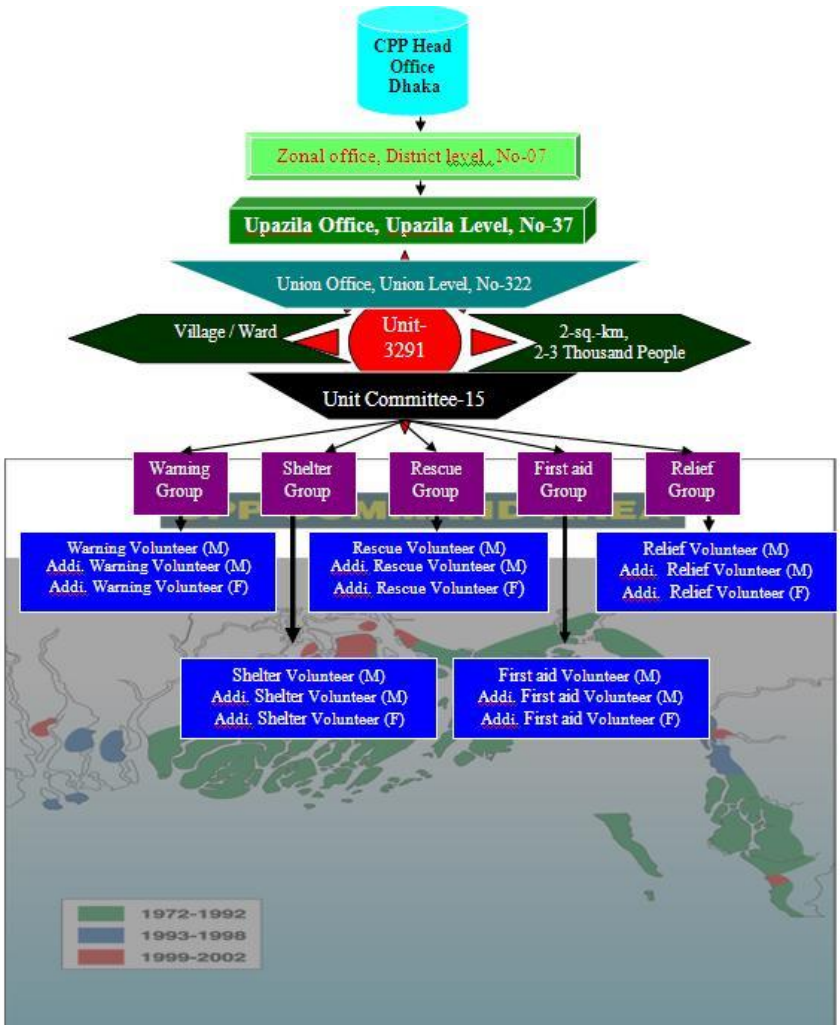


Figure 3.4 | Organisational structure of CPP

(Source: CPP/GoB, 2015b)

3.5.3 Comprehensive Disaster Management Programme (CDMP)

The CDMP aimed to further reduce Bangladesh's vulnerability to adverse natural and anthropogenic hazards and extreme events, including the devastating potential impacts of climate change. The first phase of the programme was implemented during 2004-2009. CDMP II (2009-2015) was a natural expansion and a logical scaling up of its first phase. That pioneering phase laid the foundations for institutionalising the risk reduction approaches and frameworks developed through pilot testing. CDMP II aimed to institutionalise the adoption of risk reduction approaches, not just in its host the Ministry of Disaster Management and Relief, but more broadly across many government departments and agencies under the 13 key ministries of the government (CDMP, 2015b).

The approach of CDMP was to channel support through government and development partners, civil society and NGOs into a people-oriented disaster management and risk reduction partnership. That partnership promoted cooperation, provided coordination, ranked priority programmes and projects, and allocated resources to disaster management, risk reduction and climate change adaptation activities in Bangladesh. The programme has been considered to offer an outstanding opportunity to improve linkages with, and synergies between DRR and CCA. This applies both at the community and at the general stakeholder level. The linkages are clearly expressed in many of the activities outlined in the operational outcomes of its project design, as well as through strengthened institutional capacities. CDMP II was designed around six interrelated outcome areas (Table 3.3).

Table 3.3 | Prioritised areas of CDMP

Outcome 1	*Institutional development* for implementing risk reduction programmes at all levels
Outcome 2	*Rural risk reduction* through structural and non-structural interventions, community empowerment and improved awareness of natural hazards and climate change
Outcome 3	*Urban risk reduction* through structural and non-structural interventions and improved awareness of natural hazards particularly targeting the extreme poor
Outcome 4	Improved *disaster preparedness and response* by strengthening management capacity and coordination as well as networking facilities at all levels
Outcome 5	Better *disaster-proofing of development funding* across the 13 ministries by generating increased awareness of hazard risks and the provision of technical information, advisory services and resources to stimulate positive changes in planning and investment decisions
Outcome 6	Community level *adaptation to disaster risks in a changing climate* is effectively managed.

(Source: CDMP, 2015b)

3.5.4 Climate Change Cell (CCC)

To address current impacts and manage future risks of climate change and variability at all levels in all stages toward a climate resilient Bangladesh, the government has established the Climate Change Cell (CCC). The cell provides the central focus for the Government's climate change related work, operating as a unit of the Department of Environment (DoE). Its objective is to enable the management of long term climate risks and uncertainties as an integral part of national development planning (CCC/GoB, 2015).

CCC has established a mechanism that facilitates management of long term climate risks and uncertainties as an integral part of national development planning. The Cell also facilitates strengthening the capacity of the professionals, practitioners, policy makers to reduce unacceptable risks and improve preparedness for climate change impacts.

3.5.5 Bangladesh Climate Change Trust (BCCT)

Bangladesh Climate Change Trust **(**BCCT**)** is a statutory body formed under Climate Change Trust Act, 2010 to administer Bangladesh Climate Change Trust Fund (BCCTF). The fund was created by the government from its own resources to finance projects for implementation of BCCSAP 2009. The aim of these projects is to reduce the vulnerabilities caused by the adverse effects of climate change such as construction of embankments and river bank protective work, building cyclone resilient houses, excavation and re-excavation of canals, construction of water control infrastructures including regulators and sluice gates, waste management and drainage infrastructure, introduction and dissemination of stress tolerant crop varieties and seeds, afforestation, installation of solar panels and so on (BCCT/GoB, 2015).

3.6 Managing climate induced disasters: Community level initiatives

Local people are the core ingredient for disaster management at community level as they face natural hazards in their daily life. This helps them to develop their own coping mechanisms over the long time frame. However, in the emergency period, they need external assistance to cope with and recover from losses and damages of extreme events. Thus, both local indigenous knowledge and technology driven external assistance are considered important in community level disaster management.

3.6.1 People's coping, adapting strategies and mechanisms

In Bangladesh, the coping mechanisms of local people are primarily related to floods and river bank erosion. Normal floods in Bangladesh are considered as regular natural phenomena with seasonal submergence that occurs every year and to which people's traditional settlements and livelihood activities are well adapted. But when surges become abnormal or cause unwanted submergence and damage to property, infrastructure and crops this endangers the lives of people and their livelihoods.

Rasid and Paul (1987) explain that river floods resulting from excessive runoff are further exacerbated by monsoon precipitation. Floods are beneficial only within certain limits of timing, duration, and magnitude (Rasid and Paul, 1987; Paul and Rasid, 1993). If flooding occurs either earlier or later than the normal time (June-July) and if it stays for a longer period than usual duration (not more than four months and not beyond the month of October), or if floodwater rises higher than the usual height (not more than 2.4 m above the broadcast Aman fields), it is perceived as abnormal. Thus, there are four types of abnormal floods: early, late, prolonged, and high magnitude floods.

The people of Bangladesh have adopted numerous adjustments to cope with abnormal flooding which utilise available indigenous technological, material and societal resources (Haque and Zaman, 1993, 1994). Most of the adjustments are of a corrective type, which are practiced to minimise the damage caused by floods (Shamsuddoha et al., 2013b). Some of the corrective types of adjustments are related to social organisations and relationships; others are associated with material responses at an individual level (Haque and Zaman, 1993, 1994). Del Ninno et al. (2003) mention how households adjust to the shock of the flood in several major ways: reducing expenditures, selling assets and borrowing.

Brammer (2004) explains that individual homesteads generally are constructed on raised earthen mounds, the height of which is determined by local experience of previous flood-levels. People in flood prone areas usually are reluctant to leave their homes during times of disaster, mainly out of fear of theft of their possessions. Therefore, when floodwater rises above the level of homestead mounds, families first move onto beds or other furniture within their dwelling and raise their important possessions above water level. Then, if water levels continue to rise, they make crude wooden or bamboo platforms. Eventually, in an exceptionally high flood, they may move to roofs, trees, boat or raft and to any available higher ground such as embankments, flood shelters, houses of wealthy people (ibid.).

Further, Brammer (2004) argues that farmers' traditional cropping patterns and practices in Bangladesh are closely adapted to seasonal flooding characteristics and the risk of floods. The extra moisture and fertility provided by abnormal floods benefit the *Rabi* (dry) season crops, notably *Boro* rice. Moreover, the abrupt increase of rice prices in the dry season after a severe flood is an incentive for farmers to bring more

land under Boro rice (ibid.). Rasid et al. (1996) narrate that in the Brahmaputra (Jamuna) river floodplain, people prefer normal flood levels to which floodplain crops have been adjusted for generations. Schmuck-Widmann (1996) argues that several coping strategies are taken by char-dwellers of the Jamuna river basin during floods and throughout a year. Brammer (2004) states that in some parts of the Jamuna river basin, some local varieties of deepwater Aman rice, for example, can grow in up to four metres of water, and they can elongate their stems with increasing water depth by up to 20 centimetres per day during their main growing period.

CCC/GoB (2009) argues that the farmers in Haor basin are nowadays not choosing non-HYV (indigenous varieties) rice; they are choosing a new HYV rice and this new HYV (i.e. BR 45) takes a shorter time period to mature and this reduces the risk of crop damage due to flash floods. The villages also have become more vulnerable to flash floods and the indigenous household plinth defence mechanisms (e.g. use of long grass) are not working either.

Abnormal floods are harmful for all in terms of social class age group and gender. Hoever, women in general, are more vulnerable compared to men. Aman (1999) denotes the coping strategies taken by women in 1998 flood. Though the study was not conducted through a conventional research methodology it still gives us some information regarding the kinds of problems women faced during the 1998 flood and how they coped. Nasreen (1999) argues that women face different kinds of problems especially poor women who suffer from lack of food, clothing and shelter. However, women have to work more during floods compared to normal times and both their lives and assets suffer as a result.

3.6.2 External assistance at local level

External assistance plays a vital role in local level disaster management. Both structural and non-structural measures are implemented at local level. The government plays the major role in implementing structural measures whereas NGOs are the main actors in non-structural measures.

Structural measures for flood protection mainly comprise embankments built alongside rivers (Brammer, 2004). These usually also include sluices or regulators to enable inflow of floodwater or outflow of drainage water when needed or desired. After the disastrous floods of 1987 and 1988 which inundated about 40 percent of the

country, the World Bank (WB) assembled a consortium of governments and technical assistance organisations to develop the FAP, a long-term programme for achieving a solution to the country's flood problem (Brammer, 2004, 2010). Before the FAP, successive governments had built about 7,500 km of embankments along both sides of the major rivers (Brammer, 2004). Under the FAP, around $200 million went into 26 study projects, with some capital going into the repair of existing projects (Wisner et al., 2004). In addition, the government is involved in flood and cyclone forecasting and warning systems. Local NGOs also work side by side in cyclone and flood warning processes at local level. Most NGOs in Bangladesh take on responsibilities to disseminate disaster and climate change knowledge and learning through conducting training and workshops.

Nonetheless, there are also some governmental strategies to engage in non-structural measures, for example, increasing food-grain production, flood control and drainage investment, irrigation equipment, fertilizers, plant protection materials and high yielding varieties (HYV) of seed (Brammer, 2004:159).

The government and NGOs are trying to involve communities in local level planning and action. CDMP, for example, involved communities in identifying and analysing hazards and risks through Community Risk Assessment (CRA) – a participatory tool for risk reduction, poverty alleviation and sustainable livelihood (CDMP, 2015a). The Risk Reduction Action Plan (RRAP) is the outcome of the CRA process and the Local Disaster Risk Reduction Fund (LDRRF) under CDMP provides financial and technical assistance to the most vulnerable groups to strengthen their capacity to address localised disasters. This contributes towards strengthening the institutional capacity of disaster management committees at union, Upazila and district level.

3.7 Present challenges

Apart from the achievements in disaster management, there are still many challenges particularly regarding how local people adapt to natural hazards in a changing climate. Indigenous knowledge can be at risk in globalised policy environments. Local people need more external assistance so that they can cope with new challenges but at the same time, local level practitioners are facing challenges to implement their activities.

For cyclone preparedness and response, although cyclone shelters saved thousands of lives, focus group interviews carried out by the author with the residents of cyclone-affected areas revealed that a large section of population was reluctant to move to cyclone shelters even during emergency. Distance from the homestead, difficult access to shelters, unwillingness to leave livestock behind unprotected, scarcity of sanitation facilities, lack of user friendly facilities for women, and overcrowded conditions in shelters have been recorded as the primary reasons behind their reluctance (Dasgupta et al., 2009).

Kumar et al. (2010) reported that Cyclone Aila in 2009 destroyed many water sources in Khulna region including ponds and rainwater harvesting reservoirs. Thus, the existing technology such as desalination plants, rainwater harvesting reservoirs and pond sand filters (PSF) are not workable at present. CCC/GoB (2009) explains that the waves of unpredictable flash floods in the Haor basin in monsoon season are becoming too strong for the deep water Aman rice varieties. In addition, these strong waves cause erosion. Alam et al. (2010) argue that raising homesteads should be developed above average tidal heights but will be only a modest solution in flood prone areas. He adds that insurance coverage at household level is needed for the vulnerable groups and disaster survivors.

3.8 Summary

This chapter has provided an overview of Bangladesh-based perspectives on hazards, disasters and vulnerability in changing environments of that country, people's coping mechanisms and external interventions in this context. Apart from the high levels of potential threat from climatic extreme events, the country has a long history of disaster management including through the paradigm shift from relief and response to comprehensive disaster management and the further moves to incorporating the concept of DRR–CCA. It is observed here how knowledge, experiences and practices transfer have been from the 'experts' to the people and occasionally vice versa, particularly in terms of awareness building and skill development activities. This chapter also explored a range of actors working in this discipline including the government, local governments, foreign governments, development partners, NGOs, media, academics, and the public. The subsequent chapter will summarise the methodological framework used in this study towards an understanding of the potentiality of DRR as climate change adaptation in the Bangladesh context.

Chapter Four

Research methodology

CHAPTER FOUR
Research methodology

4.1 Introduction

This chapter presents an ontological and epistemological orientation of this thesis, research methods used, details of field practice and the positionality of the researcher. Overall the study objectives require an understanding of how local people and development practitioners operating at community level adjust themselves in relation to a changing political environment of disaster management and climate change that is influenced by international and national policy drivers. To this end the chapter illustrates a justification for the predominantly qualitative research methodology chosen for the study including application of ethnographic research methods for some aspects.

4.2 Ontological argument and epistemological position

This research requires the knowledge of how local people, including disaster survivors and development practitioners at community level, are adapting in rural areas of Bangladesh in relation to the changing context of DRR and CCA implementation. According to religious faith, many disaster survivors of rural Bangladesh believe that environmental disasters are the 'acts of God' rather than the 'acts of humans' (Ikeda, 1995). They pray to God for His assistance in an emergency, though simultaneously they often seek support from their neighbours, relatives, friends and then finally the outsiders (Mohammad, 2014). For them this is the beautification of the way of their belief and understanding their own life. Being a monotheist, my own ontological orientation is that as God creates a unique system in nature and balanced relationships amongst the phenomena within it, when there is imbalance due to unexpected interventions such as environmental exploitation by humanity, nature reacts through adverse impacts (e.g. natural hazards). This impact includes impacts on human beings followed by bouncing back to a normalised position. The research therefore sought to derive original knowledge from natural settings and also from within people's outer beliefs and understandings.

The epistemological position stems from “the nature of the relationship between the knower, or would be knower, and what can be known” (Edgeworth, 2010: 84). Epistemology includes “how social phenomena can be known, how knowledge can be demonstrated and what can represent knowledge and evidence of social reality” (ibid: p: 84). The epistemological position can therefore simply be “how do we know what we know”. Here, the epistemological position was primarily to focus on the relationships between the researcher as an outsider and the respondents as insiders to achieve knowledge in a real social setting (Miles and Huberman, 1994). Knowledge is placed somewhere between the researcher’s ‘belief’ and ‘truth’ in reality. It is acknowledged that some human characteristics of personality, beliefs, bias and prejudices of the researcher influence the process of his research. These human characteristics may also convince the researcher to retain truthfulness in knowledge and reality (Lincoln and Guba, 1985). Regardless of ontological narratives, in this research knowledge is considered ‘relative’ rather than ‘absolute’ which offers wider space to the research, learning from respondents, sharing and gathering information with an open mind. The participants in this research were therefore involved in the process of knowledge creation within this perspective. Subjectivism is here associated with the qualitative techniques, particularly participatory tools that were able to address power relations and inequality in a more open and secure way (Guba and Lincoln, 2005).

My epistemological position in this research is therefore mainly based on the development of strong and longstanding relationships with the respondents in the research localities during the last few years. Though I had used both detailed quantitative and qualitative approaches in my previous studies, the research reported in this thesis was able to better explore new frontiers of in-depth knowledge through application of qualitative methods with research participants.

4.3 Methodological approach

This research used an inductive methodological approach with qualitative methods prioritised in understanding how DRR and CCA are working together at the community level. It has been possible to qualify local people’s vulnerability and adaptive capacity to deal with both disasters and climate change. As presented earlier, this has required knowing about the trends in external interventions of government,

NGOs and development partners of disaster management, together with local people's knowledge and practices in this changing environment. The research has been able to show how DRR and CCA may be working in practice in relation to the emergent theoretical knowledge and policy going on at international, regional and national levels. To this end I used different qualitative research methods including semi-structured interviews, FGDs, PRA tools and ongoing observation in my study. A structured questionnaire was used for collecting quantitative data with the Sidr survivors. The study has also collected secondary data including from archival sources. This chapter includes a discussion about the application of the study area to the research, respondents of the study and different methods used in the research as well as how and why they were selected. To give a sense of my own engagement with the research process the following sections are deliberately written in the first person form of English.

4.3.1 Plan and process of field study

According to my original research plan, I was primarily involved in collecting field data in Bangladesh for about one year (Table 4.1). A longer visit followed by a shorter visit completed this process. The duration of my first visit was nine months from 08 January 2012 to 11 October 2012. My primary plan was to complete fieldwork through a single visit but this was not possible due to political unrest in the country. Thus, a complementary visit was needed to complete the rest of the activities according to the initial research design. This three-month long visit was carried out between 12 December 2012 and 11 March 2013.

Preparation for fieldwork started long before going to Bangladesh through contact with RDA personnel regarding logistical support, and I remain actively engaged in these areas until present. After arrival in Bangladesh I set up my working hub for fieldwork at RDA, Bogra – the organisation I also work for when not researching with Northumbria University. RDA not only allowed for continuity with some of my former research environment but also ensured access to study villages. Dhaka, the national capital, and Rajshahi, my hometown also remained within reasonable reach during this period. However, whilst carrying out much of the fieldwork I lived at the RDA guesthouse. I considered the RDA campus as a base for managing and analysing my collected field data.

Table 4.1 | Fieldwork schedule

Date	Location	Description of work
First Field Visit		
January – February 2012	RDA, Bogra	Establishing field work hub at RDA and preparation for logistic supports
February 2012	Rajshahi	Pilot survey
March – May 2012	Sirajganj	Field work in **Village I [Bonna]**
June – July 2012	Barguna	Field work in **Village II [Sidr]**
July –August 2012	Satkhira	Field work in **Village III [Aila]**
September 2012	RDA, Bogra	Finalisation of field data
Second Field Visit		
December 2012	Barguna & Satkhira	Field work in Sidr and Aila village
January 2013	India	Participated in three international conferences and country visit
February 2013	Sirajgonj	Field work in Bonna village
March 2013	Dhaka	Meeting with national level experts

(Source: Author)

4.3.2 Research assistants

I selected two female and two male research assistants for my study. All of the research assistants were graduates from the north-western region of Bangladesh. However, the scenarios presented of the flood affected chars of the River Jamuna were distinct experiences for them as these assistants were borne and brought up in urban settings. I therefore arranged a day long training session for them before starting my fieldwork to provide an overview of the study areas and the aims and objectives of this research, including how they would assist me in the field in terms of collecting, managing and analysing field data. The main responsibilities were to assist me in conducting FGDs and applying PRA tools. My research team conducted a questionnaire survey at Sidr village. They also maintained their own dairies to note observations that were important to them regarding my study which helped me to cross-check and reflect on my own observations. An additional contribution of my research assistants was through some of the transcribing of the audio recorded interviews followed by translating these from Bangla to English.

4.3.3 Pilot survey

Before the beginning of my main study, I conducted a pilot survey at a char-land in Rajshahi district. The pilot visit helped the research assistants in terms of their familiarising with research methods as well as with the lifestyles of the char-dwellers. I personally carried out informal conversation and an FGD session. Through this process, my research assistants engaged in FGD and PRA work that they would also continue to use.

4.3.4 Field visit to the char-lands of Jamuna River: Bonna village

First of all, I visited Bonna village in Sirajgonj where I have had very good relationships with the char-dwellers since 2005. In terms of ethnographic perspectives, entrance to a community is very important in order to explore original knowledge in a natural setting.

I easily accessed the community with my research team due to the establishing of trust built up over a long time period. We stayed in spare rooms at the branch office of a local NGO. After arrival at the char I conducted 'transect walks' with my team members for familiarising them with the local natural and social setting. I selected the same place for conducting FGD and PRA sessions where I had done previous sessions. Our group meeting place is the front yard of the house of a CLP beneficiary who I consider to be one of my good local friends. The in-depth interviews were however carried out independently at the places where the interviewees preferred to meet. Female participants chose the house where their interview would take place whereas male participants met at the local market place. As experienced by my research Supervisor from the UK during his short visit to this area, I am recognised as a common face to the char-dwellers as they have been observing my research activities in their area since 2005. Apart from conducting interviews, and FGD and PRA sessions, I spent most of my time at different points of the char market place, NGO office and an open space near the local primary school. I chose to be situated in these locations since these presented the opportunity to regularly meet many people there and to be able to talk with them informally whilst regularly sharing greetings. These informal discussions were converted to constructive interactions for my research. Every evening after coming back to our room, I sat with my research team and discussed about that day's activities, particularly our individual observations. We

also prepared for the next day's activities. I maintained my diary on a daily basis to note any additional information or reflections.

4.3.5 Field visit to the coast: Cyclone affected Sidr and Aila village

After completing my fieldwork at the Jamuna river basin, I travelled to the coast. I chose Sidr village in Barguna district to visit first. I have been visiting that village since 2009 for one of my RDA research projects. I accessed and conducted fieldwork in the community with my team without facing any challenges using rooms in the local dak-bungalow or rest house at Patharghata town. As with the previous village, I began my fieldwork there by conducting 'transect walks' with my team members to familiarise them with the local natural and social setting that is different from the Jamuna river basin. We conducted our FDG and PRA sessions at the yard of a house at the central part of the village so that anyone could come there easily. As I stayed in Patharghata town, I spent all day in the village and tried to meet my respondents on multiple occasions. I visited the local cyclone shelter 4-5 times to observe how local people utilise the shelter in a non-cyclone normal period. I discussed with the shelter management committee regarding how they manage it and interviewed a CPP volunteer to know how he engaged with the circumstances of Sidr and Aila.

Aila village situated in Satkhira district was the third and last study area of my research. As I had not visited this village before my current study, I contacted a local NGO to arrange our accommodation. We stayed in a fisheries hatchery because of no other accommodation facilities in Ashashuni such as dak bungalows or hotels, and due to poor communication with Satkhira district town. Like other villages, I conducted the array of my planned data collection methods there. I spent most of my time at the Upazila bazaar where I met different people not only from my study village but also from other villages of the Upazila. Apart from my planned fieldwork, I then also visited Pratapnagar, the southernmost union of Ashashuni at the request of the local Upazila female vice-chairperson. Moreover, I visited Nalta, a prominent growth centre at Kaligonj Upazila, for observing different activities of Dhaka Ahshania Mission, a famous national NGO of Bangladesh. This series of field engagement was throughout typical of how both systematic and informal data collection and observational activity progressed throughout much of the research at the local level.

4.3.6 Interviewing practitioners and academics

Apart from the local people and development practitioners at community level, I interviewed government and NGO personnel at Upazila, district and national level. I also consulted with academics and national policy-makers regarding my research questions.

4.3.7 Revisit the study area

After completing my nine month long intensive fieldwork in Bangladesh, I returned to Newcastle. I revisited my study villages for a short duration to clarify emergent issues from the data and to meet further key informants. Moreover, I was invited by the organisers of three international conferences in India to share my research findings from the initial analysis of the findings.

The return visit included to the coastal study villages where I spent two weeks. I closely observed individual's activities rather than the community as a whole. I also observed the activities of different post- Sidr and Aila projects. I then visited Bonna village with the same objectives. I also went to Dhaka to interview national policy-makers and academics.

4.4 Study area

Three villages from two distinct geographical locations were selected for understanding local knowledge and practices with contrasting socio-cultural differences between flood and cyclone prone areas of Bangladesh (Giddens, 1984, 1993) (Figure 4.1). One village was selected from Jamuna river basin. The village, actually a char-land is situated in Chauhali Upazila under Sirajgonj district. The main reason to select the village is its location that is frequently affected by floods and river bank erosion, and both the government and NGOs are involved in many development projects and programmes primarily addressing DRR and CCA. Another reason to choosing the village was in relation to the researcher's own positionality. I had repeatedly visited the village for conducting previous two studies of RDA and CLP since 2005 and this was also the study area of my MSc dissertation. It was considered this would be a good option for exploring the research questions of this PhD thesis since a process of learning through engagement had been established with sufficient time-frames for reflection. In practical terms it also helped me in developing a long

term healthy relationship with the local people including groups of women and local development practitioners – promoting a participatory rather than extractive environment for the research.

In order to select cyclone affected villages, initially I choose Sidr village to understand survivors' recent experiences and how they responded to pre-disaster activities including EWS. This was also to explore post-disaster interventions. Barguna and Bagerhat district were those most severely affected by Sidr. These areas had also been the field study locations of my recent RDA work. One village from Patharghata Upazila under Barguna district was selected for the present study. Later I realised a need to also consider cyclone Aila affected areas as this cyclonic event had hit the south-western part of Bangladesh with massive economic and livelihood losses and was being reported with different effect. Following further consultation, I choose the third study village from Ashashuni Upazila under Satkhira district. This was the only study village I had not visited prior to 2012. The village had an additional relevance not least due to its distinct shrimp-culture based livelihoods and its closeness with the Sunderbans, the largest mangrove forest in the world. It had been reported in the press that these features made it different to other cyclone affected areas. An RDA water supply project was being implemented in the next village and a local partner NGO of that project assisted me to select this study village on the basis of my consultation with him about the research topic.

Figure 4.1 | Location of the study villages

(Source: Author)

Before selecting the study villages, I had as part of the health, safety and ethical screening process of this research also examined a number of additional factors such as accessibility, local logistics and personal safety. The names of the three villages are Bonna, Sidr and Aila – where the first village is primarily prone to floods and river bank erosion and the last two are prone to tropical cyclones and river or coastal erosion (Table 4.2). The names given to the villages are fictitious to protect the identity of the villages and the villagers involved in the study.

Table 4.2 | Key features of the three study villages

Village name	**Location**	**Key features**
Village 1: Bonna	Upazila: Chauhali District: Sirajgonj Division: Rajshahi	• *Bonna* means severe flood • Regularly flooded as it is a Char (river island) of Jamuna river without the protection of any embankment or dam • Often affected by severe floods • River bank erosion and drought are other environmental hazards • Though many char-dwellers primarily depend on on-farm activities, many others are involved in different off-farm activities i.e. handloom work. • A number of people are also temporary migrants.
Village 2: Sidr	Upazila: Patharghata District: Barguna Division: Barisal	• Cyclone Sidr hit the Bangladeshi coast in 2007 • Situated on the mouth of river Boleshwer severely affected by Sidr • Cyclone Aila crossed the area with low-level effects • River bank erosion is another climatic related hazard • Fishing is the primary livelihood strategy for most people in this settlement whereas others depend on agriculture.
Village 3: Aila	Upazila: Ashashuni District: Satkhira Division: Khulna	• Cyclone Aila hit the west coast of Bangladesh in 2009 • Situated around 80 kilometres away from the coast and protected naturally by the Sunderbans, the largest mangrove forest of the world • Severely affected by Aila in terms of economic losses • River bank erosion and salinity are the major hazards • Shrimp farming is the primary means of a livelihood in and around this settlement • All cultivable rice fields have been converted into shrimp farms.

(Source: Author)

4.5 Respondents of the study

The research engaged three branches of field-based information indicated in Figure 4.2. The primary respondents of the study were the local people and local level development practitioners. National level policy-makers and academics were also included in the study. The local people discussed how the atmosphere of the "specified DRR–CCA scheme" is manipulating their existing knowledge and capacities and confronting them with new disaster risks. High level government and NGO officials discuss how they balance between international and national interests, and local needs. The results of the three strands of inquiry are later reflected in three empirically based chapters of this thesis (Chapters 5, 6 and 7).

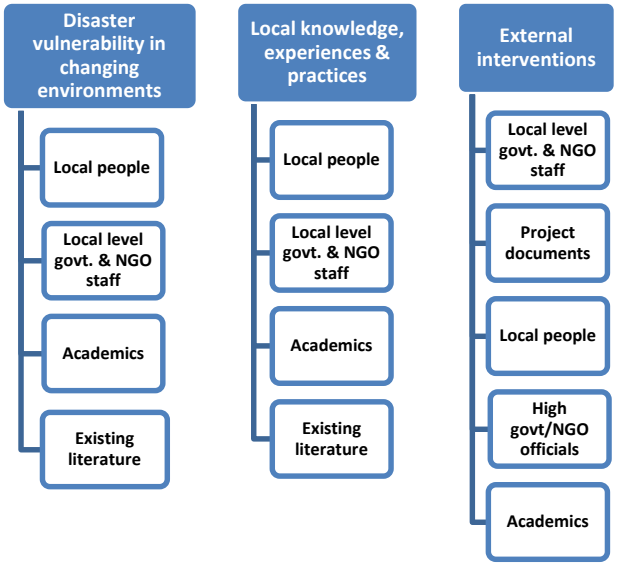


Figure 4.2 | Lines of inquiry and accompanying sources of information used to derive the core of the thesis

(Source: Author)

An ethnographic aspect of my work was to concentrate on small sample sizes to generate more in-depth and comprehensive knowledge rather than using sampling formula that would be pursued as part of quantitative studies (Silverman, 1993; Robinson, 1998; Hay, 2010). However, I also considered my respondents as 'community people', meaning I needed to collect wider information about the whole community (Kuzel, 1992) as seen from these respondents. My primary understanding about my respondents is how they live together and share their daily needs with their

neighbours, friends and relatives particularly in an emergency and how they cope with disaster as a community rather than solely as individuals (Renard, 1991; Crow and Allan, 1994). I observed that often development practitioners choose their beneficiaries based on the socio-economic conditions of a 'household' rather than the whole 'community' (CLP, 2015). Sometimes they consider an individual's issue, particularly a person with a feature of difference, such as disability (ibid.). My understanding is that, in an emergency, the whole community needs to respond rather than individuals, though individuals can have special needs. Thus, I tried to gather as many participants in FGD and PRA sessions as viable in terms of being able to facilitate coherent meetings. I took ongoing care prior to selecting my respondents from the study villages to ensure realistic representations of the community. As I considered household's socio-economic status and means of livelihood, and, in some cases, individual's challenges. This was in effect a purposive sampling method of selecting respondents for in-depth interviews. To select government and NGO officials at Upazila and national level, I applied the method of purposive samplings partly being a function of individual's availability at his or her working station, interest and motivation, and willingness to share his or her organisational information as well as answering my research questions (Creswell and Clark, 2007).

4.6 Research methods

The qualitative research methods I conducted include 29 semi-structured in-depth interviews; nine FGD sessions, five PRA tools, researcher's observation and informal conservation (Table 4.3). A structured questionnaire was also used for collecting field data at Sidr village and 50 respondents were surveyed. A brief discussion on the data collection methods I used in my study is given below.

Table 4.3 | Research methods used at the fieldwork in Bangladesh

Research methods	Bonna village	Sidr village	Aila village	National level
In-depth interviews (29)	Community people – 5 Local level practitioners – 3	Community people – 4 Local level practitioners – 4	Community people – 4 Local level practitioners – 3	Government officials – 2 NGO managers – 2 Academics – 2
FGDs (9)	No. of sessions – 6 (number of participants: 10-22)	No. of session – 1 (number of participants: 7)	No. of session – 2 (number of participants: 8-10)	
PRA tools	Transect walks Wellbeing analysis Seasonal calendar Timeline analysis Priority ranking	Transect walks Wellbeing analysis	Transect walks Wellbeing analysis Priority ranking	
Questionnaire survey		Sample size – 50		
Researcher's observation	Since 2005, particularly during the fieldwork of this study	Since 2008, particularly during the fieldwork of this study	Throughout the fieldwork	
Informal conservation	Throughout the fieldwork	Throughout the fieldwork	Throughout the fieldwork	

(Source: Author)

4.6.1 Semi-structured in-depth interviews

In-depth interviews with key informants were the main research method of my field data collection. The process of the interviews was more along the lines of conversations rather than as prescribed procedures with fixed questioning and unilineal set targets and objectives (QSR International, 2014). There is often no difference between an interview and a conversation in an ethnographic study (Burgess, 1991; Bryman, 2001; Crang and Cook, 2007). Semi-structured in-depth interviewing can be a flexible approach to produce qualitative data and it offered not only to utilise predetermined queries of the researcher but also allowed the respondent to express his or her opinions that often led to new topics of interest. The purpose of this type of interview is to understand the life-world of the respondents and how this may contrast from others. Gaskell (2000: 44) states that "the qualitative interview

provides the basic data for the development of an understanding of the relations between social actors and their situation." Semi-structured interviews involve four key stages: (i) developing a 'topic guide'; (ii) selecting respondents; (iii) undertaking the interview; and (iv) introducing interpretive frameworks to understand the actor's accounts in more conceptual terms, often in relation to other observations (Ayers, 2010: 58-59). The topic guide prompts an interview and produces a framework for face-to-face open ended discussion between the interviewer and the respondent. However, the interviewer needs to record and insist on any issues beyond the guide that get raised by the respondent. In terms of selecting respondents, Gaskell (2000) emphasised the purpose of qualitative research – as exploring a range of opinions rather than counting opinions. Thus, it is important to consider "how a social setting might be segmented on a particular issue and attempt to cover the different perspectives adequately" (Ayers, 2010: 59).

However, though in the case of my research the interviews were semi-structured, I always tried to obtain the original knowledge that could answer the research questions. As the majority of my key informants were people who are involved in their day-to-day lifestyle and livelihoods, I respected their daily routine and manage to talk to them during what they considered to be their leisure time. Therefore, in many cases my interviews were not completed in a single sitting. A longer conversation was often followed by one or more shorter conversations. This was not only to be able to consider interviewee's time but also to create more time for exploring new or additional knowledge. The final sample size for the in-depth interviews at community and local level was 23 (Table 4.4).

I also interviewed government and NGO staff responsible for implementing programmes and projects on disaster management and climate change at community level. These interviews were completed through single conversations. Moreover, I discussed the study content with government and NGO personnel, and academics primarily involved in national level policy-making and action plan processes.

Table 4.4 | List of the respondents for in-depth interviews

Serial number of the interviewee	Occupation	Sex	Age	Area
Interviewee 1	Landless person	M	38	Bonna
Interviewee 2	Housewife (male-headed household)	F	32	,,
Interviewee 3	Housewife (female-headed household)	F	50	,,
Interviewee 4	Rice farmer	M	35	Sidr
Interviewee 5	Wage worker (agriculture)	M	36	,,
Interviewee 6	Fisherman	M	45	,,
Interviewee 7	Housewife (female-headed household)	F	45	,,
Interviewee 8	Shrimp farmer	M	42	Aila
Interviewee 9	Wage worker (shrimp-farming)	M	36	,,
Interviewee 10	Migrant worker	M	50	,,
Local people – 10				
Interviewee 11	Landowner-cum-business person	M	70	Bonna
Interviewee 12	Imam (religious leader)	M	48	,,
Interviewee 13	Local elite	M	58	,,
Interviewee 14	,,	M	44	Sidr
Interviewee 15	School teacher	M	56	Aila
Interviewee 16	Local elite	F	38	,,
Local elites – 6				
Interviewee 17	NGO staff	M	43	Bonna
Interviewee 18	,,	F	46	Sidr
Interviewee 19	CPP volunteer	M	25	,,
Interviewee 20	Govt staff	M	38	Aila
Local level practitioners – 4				
Interviewee 21	NGO manager	M	55	Chauhali
Interviewee 22	Govt officer	M	37	Patharghata
Interviewee 23	Upazila level leader	F	42	Ashashuni
Upazila level practitioners – 3				
Interviewee 24	Govt. high official	M	40	Dhaka
Interviewee 25	,,	M	50	,,
Interviewee 26	NGO high official	F	45	,,
Interviewee 27	,,	M	55	Sirajgonj
Interviewee 28	University professor	M	56	Dhaka
Interviewee 29	University lecturer	M	28	Rangpur
National policy-makers and academics – 6				
Total number of in-depth interviewees - 29				

(Source: Author)

4.6.2 Focus group discussion (FGD)

Focus group discussion (FGD) is also a form of in-depth interview with a group of people, and has similar advantages and disadvantages to semi-structured in-depth interviews (Ayers, 2010). FGD is an important method of data collection in ethnographic research through congregating together a group of people who willingly discuss amongst themselves particular issues to explore reliable and valid data (Krueger and Casey, 2000; Pratt, 2002; Wilkinson, 2004). This method offers the participants an open environment where they can identify problems and explore probable solutions freely (Bouma, 2000; Pratt, 2002; Duggleby, 2005). FGD may produce multiple opinions from the respondents rather than a single outcome. Hay (2010: 157) states that "it is a highly effective vehicle for exploring the nuances and complexities associated with people-place relationships." One or two vocal individuals can dominate a FGD session, although careful facilitation can avoid this to some extent (Ayers, 2010).

I conducted nine FGD sessions in total (Bonna village – 6, Sidr village – 1 and Aila village – 2) (Table 4.5). The first FGD at Bonna worked as an ice-breaking event to gather together people of different ages, sex and economic backgrounds (Goss and Leinbach, 1996) whereas the other sessions focused on the same gender "ensuring homogeneity within the group and heterogeneity between them" (Bedford and Burgess, 2002: 124). My previous visits altered my misconception that a mixed gender FGD would have less attention to female participants and their problems. I observed that women were actively involved in discussions alongside their male counterparts. However, in some cases, including for more sensitive local issues, they wanted to discuss it separately amongst themselves. I therefore arranged two separate FGD sessions for female and male participants to explore gender-specific flood vulnerability and their adaptation strategies. The number of the participants of the FGD sessions was varied as I accepted as many as possible for the different communities. My goal was to facilitate the emergence of diverse but valid information that could potentially answer my research questions. Thus, I spent a lengthy period of this research collecting original grounded knowledge through accumulated interactions of many people through these events. The sessions were conducted in an open way to ensure everyone's active participation.

Table 4.5 | List of FGD sessions conducted for the study

FGD session (village name)	Number of participants (type of participants)	Aims and activities
FGD session 1 (Bonna)	22 (mixed gender)	• Building strong relationship with the participants that helped to continue the rest of the fieldwork • Wellbeing analysis
FGD session 2 (Bonna)	18 (mixed gender)	• Seasonal calendars: seasonal distribution of hazards; and flood variability • Timeline analysis: timeline of floods over 30 years • Priority ranking: comparison between present and future hazards • Summary of the characteristics of four types of floods
FGD session 3 (Bonna)	15 (mixed gender)	• Seasonal calendars: seasonal scarcity and felicity; and seasonal calendar of livelihood availability • Timeline analysis: seasonality impact on people's vulnerability • Chart of livelihood diversification • Table of places, causes and duration of seasonal migration
FGD session 4 (Bonna)	14 (farmers only)	• Seasonal calendar: farmers' crop calendar
FGD session 5 (Bonna)	10 (male only)	• Priority ranking: men-specific flood vulnerability • Table of coping strategies by men
FGD session 6 (Bonna)	16 (female only)	• Priority ranking: women-specific flood vulnerability • Table of coping strategies by women
FGD session 7 (Sidr)	7 (mixed gender)	• Building strong relationship with the participants that helped to continue the rest of the fieldwork • Wellbeing analysis • Selection of respondents for the questionnaire survey
FGD session 8 (Aila)	10 (mixed gender)	• Building strong relationship with the participants that helped to continue the rest of the fieldwork • Wellbeing analysis
FGD session 9 (Aila)	8 (shrimp farmers only)	• History of introducing shrimp farming and livelihood related impacts • Priority ranking: changes in hazard ranking list after cyclone Aila

(Source: Author)

4.6.3 Participatory rural appraisal (PRA) tools

Participatory rural appraisal (PRA), which is often also abbreviated simply to participatory appraisal (PA), is an approach that enables local people to plan, monitor and evaluate their own development activities, and that may lead to increased empowerment (Huda, 2005). PRA is originally driven from the activist adult education methods of Paulo Freire (ibid.). In the early 1980s Robert Chambers used the term 'rapid rural appraisal' (RRA) to describe techniques implemented to explore field data in Thailand since development practitioners have become dissatisfied with biased field data collected through conducting conventional techniques (Chambers, 1983; Huda, 2005). Later by mid-1990s, RRA has been replaced by PRA by development of methods and techniques of data collection. There are some other new terms like participatory reflection and action (PRA), participatory learning and action (PLA) and later simply participatory appraisal (PA). However, still PRA is the most common term used by NGOs in Bangladesh.

There are three pillars of PRA: (i) attitude and behaviour; (ii) methods (PRA tools); and (iii) sharing (facilitation) (Huda, 2005). Attitude and behaviour refer to "changes in the behaviour and attitude of outsiders, with self-critical awareness, embracing and learning from error, and reversals of roles, with outsiders respecting, and learning from and with, rural people" (Chambers and Shah, 1991: 1). Methods of PRA employ a variety of accessible techniques and tools used for learning from, with and by rural people within their natural setting (Huda, 2005). Sharing or facilitation refers to "a spirit of non-possessive openness, sharing knowledge, training, methods and approaches between practitioners, between organisations, and between rural people and each other and outsiders" (Chambers and Shah, 1991: 1).

The main principle of PRA is that researchers "hand over the stick" to rural people so that they are empowered, encouraged and enabled to do the right thing for themselves (ibid.). The role of outsiders in a PRA session is as facilitators for assisting rural people to identify problems and probable solutions in relation to a particular issue or theme. PRA is a flexible technique of data collection; thus outsiders (researchers) often need to use their own judgement (Huda, 2005). Being a part of team work, each member of a PRA facilitation team has specific responsibilities and necessary attitudes that can help to conduct a session smoothly. Though there is no fixed arrangement, A PRA team usually consists of three members: team leader, facilitator and note-taker. Table 4.6 shows the major responsibilities and necessary attitudes of the PRA team.

Table 4.6 | Summary of responsibilities and attitudes of PRA team members

Team member	Responsibilities	Attitudes
Team leader	• is responsible for PRA team • is responsible for all administrative and logistic supports concerning PRA session • moderates a PRA session and evaluation meeting after the session • introduces PRA team to community • coordinates PRA event and facilitates group presentation • facilitates summarising and documentation process • stays in close contact with key informants/ local contact persons	• is well-organised • be kind and patient at all time • has a good sense of humour • keeps low profile • listens, observes and consults
Facilitator	• introduces PRA tool to group/community • facilitates PRA session • moderates the process of a PRA tool • avoids complicated/ academic terms and words • acts as a catalyst between individuals of a group • creates such an environment where all participants are able to express their own opinions • keeps the group members on the concerned topic as well as be flexible to handle additional new information • takes care of time management • supports note-taker in gathering all relevant information and assists him/ her in finalising documentation	• has flexibility, patience and a good sense of humour • is able to speak local language • has motivational capacity • keeps a low profile during a PRA event • listens, observes and consults
Note-taker	• brings along necessary PRA materials • observes PRA session form the background • writes down all important information • assists facilitator in an indirect way by giving signs (e.g. shoulder tapping), if necessary • takes care that participants copy any visualised subject (e.g. map, diagram) on paper sheet • consult with team leader and facilitator about documentation of PRA event after the end of the event	• is a good observer and listener • has good note-taking skill • is familiar with the language used

(Source: adapted from FAO, 1999)

There are many techniques within PRA but these can be divided into five categories: group discussion and information analysis; maps; time and seasonality; diagrams; and matrixes (Huda, 2005). In the present study, five PRA tools were used; transect walks, wellbeing analysis, seasonal calendars, timeline analysis and priority ranking (Table 4.7).

Table 4.7 | List of PRA tools conducted for the study

PRA tools	Villages	Characteristics of data
Transect walks	Bonna Sidr Aila	• Familiarity with geographical and social conditions of the study area
Wellbeing analysis	Bonna Sidr Aila	• Socio-economic division of the study area • Selection of respondents for the in-depth interviews of the study
Seasonal calendar	Bonna	• Seasonal distribution of hazards • Flood variability • Seasonal scarcity and felicity • Farmers' crop calendar • Seasonal calendar of livelihood availability
Timeline analysis	Bonna	• Timeline of floods over 30 years • Seasonality impact on people's vulnerability
Priority ranking	Bonna Aila	• Comparison between present and future hazards • Gender-specific flood vulnerability • Changes in hazard ranking list after Aila

(Source: Author)

Transect walks

The main aim of transect walks are to explore the physical layout of an area along with its specific features and their spatial differences. These are systematic walks with key informants from one side to another observing, asking, listening, looking, identifying different problems and possible solutions they consider relevant to the village (Huda, 2005). Transect walks as the first PRA tool help a PRA team to familiar with a new village community that can assist the team to conduct other PRA tools and questionnaire survey. This tool also helps in triangulating data collected through other PRA tools. Transect walks are an information-gathering tool that only needs prior information on identifying the suitable transect line or route which should cover all topographical features and land-use patterns of the selected area. This PRA

tool is able to collect existing observable situations and features (ibid.). However, transect walks serve as an entry point for more in-depth analysis of a study area.

As I was familiar with Bonna and Sidr villages in some detail from earlier participatory work, I also concentrated on using this tool at Aila village to make me familiar with the physiographic and social conditions of the village. In every transect walk, I started my journey from one end to the other end of the villages and made notes about different geographical and social characteristics. These included topography, soil type, land use pattern, agricultural production, hazard type and duration, household-based assets, population size, education and health status, localised problems and any apparent solutions. My research assistants also helped me to draw diagonal sketches of the study villages. The summary of the transect walks at Bonna village attached as Appendix 3.

Wellbeing analysis

Wellbeing analysis is carried out primarily to classify the people of a community into different categories according to their occupation, resources, skills and social status (ibid.). This technique considers local criteria of wellbeing rather than a standard measurement, which can reflect local people's position within their community. It is also sometimes used in the form of 'wealth ranking' as it primarily considers household based economic conditions.

Wellbeing analysis is the first PRA tool I chose to conduct with my participants of the FGD sessions. I facilitated these to be divided into different groups according to their socio-economic conditions. Through this process the participants of all three villages divided themselves into four groups: rich or well-off, middle class, poor and extreme poor. The participants of Bonna and Sidr village preferred to rank to the category well-off instead of rich. They argued that though the rich people have more assets compared to other social groups the rich people are also vulnerable to disasters. The participants of Aila village preferred the use of 'rich' as that group has plenty of assets through shrimp farming. The participants chose the criteria for wellbeing ranking based on local level assets. These importantly also exposed pride and prejudices as well as thoughts about protection from disaster losses and damage. The indicators referred to included amount of cultivable land; housing condition and number of bedrooms; availability of livelihoods; ownership of a boat, tube well and sanitary

latrine; and level of educational qualification. The summary of wellbeing analysis done by the participants of Bonna village is attached as Appendix 4.

Seasonal calendar

This participatory technique explores seasonal constraints and opportunities by diagramming changes month by month throughout the year (ibid.). This tool is used as a cross-check technique to confirm that names of months are in common. It can be conducted by asking people to use pieces of stick, draw histograms in the dust or with chalk or make piles of stones, seeds or powders. This is used to represent relative quantities and patterns of rainfall, soil moisture, crops, livestock agricultural and non-agricultural labour, diet, food consumption, illnesses, prices, animal fodder, fuel, migration, pests, income, expenditure, debt, children's games and so on.

This was particularly useful for this research in identifying an annual distribution of natural hazards and how these hazards can influence life and livelihoods including the traditional crop calendar of the local farmers of Bonna village. It was also used to understand weather and climatic changes over the year, and identify problems, periods of stress and scarcity, and livelihood opportunities not only related to hazards but also other social issues such as access to local institutions and power structures.

When villagers were asked how they would draw a seasonal calendar indicating hazards over the year, they selected to draw the calendar on a large white sheet instead of drawing on the ground. They drew a graph consisting of two axes. They indicated the names of all months of a Bengali year along the horizontal (x) axis and the names of major hazards along the vertical (y) axis. Different colour pens were used to draw horizontal lines representing the relative length of the hazard events. They also followed the same strategy to draw the other seasonal calendars.

Timeline analysis

Timeline analysis identifies historical sequences of events, generally over a period of years or decades (ibid.). This technique can be used to discuss significant events and identify sequences of major changes and local coping strategies over time. The important characteristic of this method is in providing reference points for trend or change analysis. This participatory technique can also monitor the impact of the identified changes and understand past interventions that help predict potential future

risks and probable adaptation strategies. Timelines as applied in this research were used to examine both general issues of changes and specific activities so as to be able to consider phases or periods of activity and inactivity as well as individual events.

It promoted discussions of events, consequences and associated issues in a historical context. This tool was used by the FGD participants at Bonna village to show the historical information of the floods they experienced over time including the magnitude of individual events and their impacts on their lives. The participants of this PRA session almost followed the same procedures as that of the seasonal calendar. They indicated all years since 1984 along the horizontal axis to draw a historical timeline of the changing flood situation. The vertical (y) axis showed the magnitude of floods in terms of their impacts on the people's livelihoods. The participants used jute stick to draw the relative vertical heights of each year's floods.

Priority ranking

This PRA tool is used for involving people in prioritisation of their problems and needs, and type of development initiative suited to addressing it (FAO, 1999). Villagers use seeds to give scores to development initiatives, either individually scoring or in small groups and aggregating for the community as a whole. This facilitates a process of democratic prioritisation by the entire community, ensuring people's involvement in their own development. Priority ranking is a very important tool for micro-planning at local level.

The participants of priority ranking used in this research selected a big white sheet to show the present and future hazards of their village. They wrote five major hazards they are experiencing at present as well as five potential future hazards they think influential for their life and livelihoods in near future. They used tamarind seeds to indicate the severity of hazard impacts on their area. Finally, the participants used another sheet for showing a ranking of hazards where 'rank 1' represents the highest severity and 'rank 5' was for the lowest. The participants also used the same procedure to rank the gender-specific flood vulnerability at Bonna village and the changes in hazard list after cyclone Aila at Aila village.

4.6.4 Researcher's observation

Researcher's observation is also a viable source of data. The presence of the researcher in the field locations is considered an opportunity to collect vital data based on "observations in natural settings" (Burgess, 1991: 79). Observation helped me to select my key informants, places and times of interviews. This method also aided in outlining an interview schedule with particular respondents of my study. Thus, Hay (2010: 242) describes participant observation as the "complementary evidence" to select respondents and other data collection methods. This was an on-going process of my study through interlinking between the knowledge I learned from scientists and academics in different international conferences and from different academic publications and the information I gathered from my key informants and study areas. My observation put me in such a position where I compared the changes over a period of time and could better understand the social realities of these locations.

As I was already familiar with two study areas, namely Bonna and Sidr village, prior to my field work for this thesis, I was able to build on my existing research exposure in some areas. I was aware of both natural and socio-political settings of those two areas. However, I was revisiting those areas after about four years. I had also visited Bonna village in Sirajgonj district previous times as a member of a CLP research team. CLP implemented its activities in this village through MMS, a local NGO. Though my previous studies were primarily focused on CLP beneficiaries, I had observed other people's lives and livelihoods beyond the CLP sphere of influence. My last two visits as part of my PhD research, created the opportunity to explore different parts of the community in terms of their socio-economic strata that had hitherto not taken place with CLP. Meanwhile, CLP had closed its activities at that village. I therefore got the opportunity to observe how both CLP beneficiaries and non-beneficiaries were adjusting within their more recent environment.

In the case of Sidr village in Barguna district, when I visited that village the local people had survived Sidr two years ago and Aila a couple of months before whilst they were still trying to recover the losses and damages of earlier events. My last two visits in that village provided opportunity to closely observe the behavioural aspects of those exposed to the cyclones. I witnessed rapid changes in disaster management related activities at local level along with the intention of incorporating climate change issues into disaster management and the wider development process.

My position with those two villages felt like being an insider and outsider at the same time as the respondents of my study trusted and treated me as their friend. However, simultaneously I considered myself an alien in a newly changing environment even though I had visited those places four years earlier. I was endeavouring to be a "stranger" and a "friend" at the same time (Hammersley and Atkinson, 1983: 100). On the other hand, Aila was a new village for me. However, my previous experience and inimitable positionality as an insider and outsider observer at the same time in almost similar natural and social settings assisted me to access those new areas and continue a core study. I kept information on my day-to-day observations in Bangla in my research diary. In addition, I took important photographs during my field work to improve visualisation (Young and Barret, 2001).

4.6.5 Informal conversations

Informal conversation is a further important data collection method which may have no predetermined specific objectives. I often played a role as a good listener rather than interviewer. The participants controlled the situation as I followed a strategy of 'going with the flow'. I regularly went to tea stalls at local market places and discussed ideas there. Often my participants asked me about the parameters of my study, and so I took such opportunity to get closer with them on its content. I did not record those informal conversations but tried to note them in writing as soon as possible after going back to my room. Sometimes those conversations continued for hours and I would attract a gathering of many people around a tea stall.

4.6.6 Structured questionnaire survey

The questionnaire survey used for the study did not aim to produce large-scale data for quantitative analysis but rather understanding of the gap between the views of different groups of respondents. The survey was undertaken amongst 50 respondents at Sidr village to explore how the cyclone survivors responded to EWS and post-disaster activities, and how their arguments differ from the government claims. The survey also helped to get a broader idea of the range of opinions that are also used to guide key informant interviews. The questionnaire used for the survey is attached as Appendix 5 (Bangla version) and Appendix 6 (English version).

4.7 Data analysis

Data analysis is a systematic process of organisation and management of data collected through use of different research techniques and tools. It involves key components and principles underlying a particular phenomenon to be discovered with the aim of providing a better understanding of the research question (Denscombe, 2003). This process includes organising results into specific patterns, categories and descriptive units whilst seeking relationships between the information obtained (Brewer, 2000).

However, data analysis in an ethnographic study is usually a continuous and progressive process which starts at the very beginning of data collection (Ely et al., 1991; Silverman, 1993). Froggatt (2001) argues that "learning by doing" is the key component in qualitative data analysis. I organised 'raw data' along the lines of descriptions of people's vulnerability and coping capacities in a changing climate and how external assistance helps them in this process. Further, I divided the themes into sub-themes. I organised and analysed my field data manually. Miles and Hubermann (1994) state there are three concurrent flows of data analysis: data reduction, data display and conclusion verification. As I spent about one year at the field and collected a large amount of data, it was a key challenge to reduce the data to be able to answer my research questions more specifically. This encouraged me to use the manual option rather than using any computer-based software. However, I used MS Excel for analysing and graphical presentation of quantitative data collected amongst the 50 participants at Sidr village. I created summary tables of analysed data presentable for wider dissemination. These data were then combined with the analysis of key themes to enable conclusions, verification and further theorising of the data.

4.8 Challenges and limitations

A successful field study is not without limitations. I and my research team faced some challenges with the diversity of situations during the entire field study. The research approaches and methods that were used for the present study also have some limitations.

Though I was familiar with the first two villages (Bonna and Sidr) through my previous studies, my research team were newcomers for the villagers. The third study

village (Aila) was not selected prior to the start of the main field study and it took around four months to select a third study village after considering the impacts of Aila on a different socio-ecological setting of the country. I needed extensive time to build a healthy relationship with the community, which reduced the allocated time of my data collection to some extent. Further, political instability during my field study period created some problems in terms of sticking to the overall main the schedule.

Though I and my team members tried to maintain the work schedule, there were some occasions when I had to reschedule my appointments with the participants for in-depth interviews. In three cases, I had to stop the interviews and finish them in the next meeting. In some cases, I had to cancel my appointments as the selected persons who had agreed to participate in the interview later refused to give interviews or avoided me. Thus, I had to select new participants for those interviews. In some cases, the government and NGO officials also rearranged the schedule. For arranging FGD and PRA sessions, my team members also faced some problems associated with venue and time selection. To minimise such unexpected problems, two venues for FGD and PRA sessions were selected at Bonna village after consulting with the villagers.

I used informal conservations with the villagers across their age, gender and social status as part of the structure of the research. Such informal conversations rarely gave the opportunity to write or record any notes on the discussions; thus I had to memorise all critical and vital information. Though I and my team members always tried to maintain diaries for gathering important information through our observations and informal conversations, there is a chance that some key points may have been missed.

I also faced some challenges during my field study in terms of participant expectations from answering the research questions of the study. As I was a new comer at Aila village before starting the present study and the field study was conducted within three years of cyclone Aila hitting the village where several post-disaster programmes were being implemented, the villagers expected that my team also came for such activities. Thus, we needed time to convince them about what was the actual reason behind the visit. Though most people of the other two villages knew me and were aware of my interests in visiting their villages, some of them were reluctant to participate again in my present studies. As they thought that they had participated in my previous studies, there was no reason to participate in the present study again. I had to convince them

how the present research was different from the previous studies and why their participation was important for the study.

According to my research methodology, the participants of the study had the right to full “freedom of speech” during any data collection sessions and meetings. I found that some of them were not entirely responsive to some questions and issues, particularly related to government development activities; their answers were biased towards their political alignment. To minimise this influence, I heard what they were saying at first and later gradually tried to motivate them to revise their statements beyond their political bias. During the interviews with the government officials and academics, in some cases, I felt they were intending to control the whole conversation and express their “influential attitude” over me. However, I tried to convince them regarding the aim of my study and why their statements were important for the research work.

4.9 Summary

This chapter has constructed the methodological framework used to address the overall research question of the study, to analyse whether adapting to climate change through disaster risk reduction is possible in relation to the community level vulnerability and capability of Bangladesh. The process of research investigation has primarily followed a wider qualitative approach to understand grounded challenges to implementation of the DRR–CCA initiative. This has included listening to the thoughts of international and national academics and policy-makers. The field study that was conducted applied several research methods designed specifically to identify community vulnerability and adaptive capacity, and how external interventions influence vulnerability and capacity from the perspective of local people and local level practitioners. These aims were achieved through the implementation of participatory methods, carried out at the community level.

Considering the gaps in integrated DRR–CCA in practice at local level, particularly in Bangladesh, I consider the present study as a very distinct research process. The inductive methodology enabled understanding of disaster vulnerability and adaptive capacity at the community level. The interpretation of community perceptions of disaster vulnerability and adaptive capacity turned out to be a complex issue to understand. This influenced the selection of several methods and techniques. Thus, the

collected data is not only “realities extracted from the field” but also “subjective truth” (Parr, 2001) that gives an opportunity to scrutinise existing theories and policies of mainstreaming an integrated DRR–CCA approach at local level. The present study is essentially a pragmatic approach to understand social vulnerability and community resilience relative to geographical construction. The empirical findings of the study are analysed and discussed in the next four chapters derived from the methodological framework described in this chapter.

Chapter Five

People's social vulnerability within the disaster – climate change nexus

CHAPTER FIVE

People's social vulnerability within the disaster – climate change nexus

5.1 Introduction

This chapter provides evidence of different factors and processes affecting people's vulnerability to disasters in the changing environment of Bangladesh, where poverty and over population are considered as root causes (Bhuiyan and Dutta, 2010). Wisner et al. (2004) point to several dynamic pressures such as breakdown of the rural economy, population pressure, inaccessibility of land for the poor, inadequate alternate livelihoods, the absence of social insurance in relation to vulnerability to the floods of 1987 and 1988. Brouwer et al. (2007) argue that families with lower income and poor access to resources are more likely to be exposed to flood risk. The whole coast of the country is exposed to tropical cyclones including in particularly in 1970 and 1991. The west part was the least affected in terms of death tolls in 2007 and 2009 due to the natural barrier ('Sunderbans') (World Bank, 2010; Haque et al., 2013; Shamsuddoha, 2013a). However, Paul (2009) argues that physical characteristics of Sidr such as duration of storm and storm surge, and landfall time and site also facilitated a decrease in the death tolls. Nonetheless, they agreed that cyclone Sidr was costly in terms of economic losses which accelerated post-disaster vulnerability. In addition, Mallick et al. (2011) claimed that cyclone Aila also damaged physical infrastructure (e.g. road networks) and obstructed post disaster activities and sources of drinking water (e.g. pond sand filter, rainwater harvesting system) causing the coastal population to be subjected to an ongoing water crisis. Moreover, the discourse about climate change and sea level rise brings complexity in terms of understanding threats to the coastal infrastructure including polders and cyclone shelters, and local livelihoods (Dasgupta et al., 2009).

This chapter presents localised experiences and perceptions of disasters and climate change as provided by both local inhabitants and development practitioners at community level. This provides an exploration of people's vulnerability to environmental disasters in a changing environment.

5.2 People's experiences and perceptions of disasters and climate change

The people of Bangladesh have been living with natural hazards since they were born and that is why they have strong inherited experiences and knowledge of hazard patterns, including how and when a hazard may become a disaster (Brammer, 2000). In recent times climate change is impacting negatively on hazard and disaster patterns as well as threatening local people's coping mechanisms, increasing their vulnerability to disasters (IPCC, 2007, 2012). The whole scenario of climate change has, however, been largely based on high technology-based scientific projection. It has failed to be balanced by a science that bridges to local people's perception of climate change within their own predictions or those of the climate science profession. This section therefore examines how local people of Bangladesh interpret disaster and climate change based on their own knowledge and experiences so as to analyse the social vulnerability discussed in the later part of this chapter.

5.2.1 Historical experiences of environmental disasters

The char-dwellers of Bonna village indicated during the group discussion (FGD session 2) that floods and river bank erosion are the main two natural hazards in their area. Figure 5.1 shows the normal duration of major hazards described by the respondents of Bonna village. A 'hazard calendar', a PRA tool, was conducted to understand regular pattern and duration of natural hazards. The respondents preferred the Bangla calendar rather the Gregorian calendar in associating hazard duration with their experiences. They prepared and ranked the hazards after discussion amongst themselves and then used different colours to represent several hazards. For example, red represents 'severe' flood to explain their state of alarm during and after a severe event whereas green represents 'normal' flood highlighting their 'living with flood' strategy, particularly for local agriculture and their agriculture-based livelihood options.

From the figure it is observed the char-dwellers face different hazards in different seasons over the year. Though there was no doubt amongst the respondents that severe flood should be ranked at the top, they argued on the length and duration of it due to the diversified pattern and magnitude of floods.

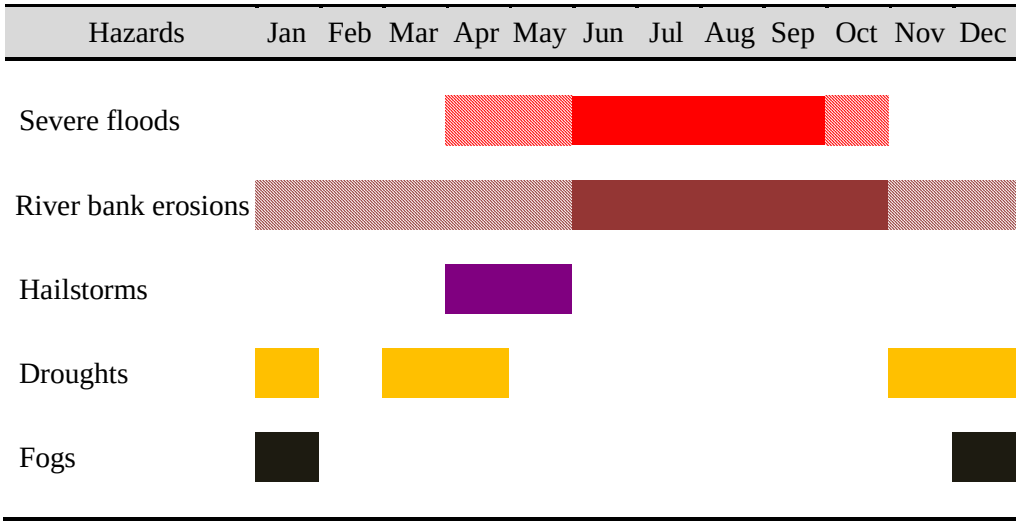


Figure 5.1 | Hazard calendar of Bonna village

(Source: from FGD session 2, fieldwork at Bonna village, March–May 2012)

The respondents stated that severe floods are often followed by river bank erosion. They claimed that river erosion is the most unpredictable disaster as it happens suddenly and erodes a large section of land including infrastructure and crop lands. They added that, in particular after severe floods when floodwater goes down, it easily undercuts the soft sandy layer of soil followed by a full collapse of the upper portion. However, further they added that though erosion and siltation are two continuous processes, they were losing more due to the erosion rate overwhelming the siltation rate. The rate of erosion is obviously higher during flood season compared to the low-flow season.

The char-dwellers including respondents themselves had experienced several involuntary displacements in their lifetime. Hutton and Haque (2004: 41) argue that such migrants experience substantial "socioeconomic impoverishment and marginalisation" which becomes a "socially constructed process, reflecting inequitable access to land and other resources."

They described how, in addition to the other hazards, hailstorm is a pre-monsoon event which may cause extensive crop damages. Drought in this char is the main cause of a lack of local job opportunity because there is a fall of agricultural production due to lack of sufficient soil moisture. This is classified as 'agricultural drought' by FAO (2007). However, this drought condition is deeply affiliated with meteorological and hydrological droughts. Dash et al. (2012) point out that droughts

occur both in the pre- and post-monsoon season. Fog is the last hazard the respondents ranked on their table as it damages winter crops but not every year.

The respondents classified floods in terms of time of beginning (longitudinal) and severity (vertical). There are three types of floods according to time of beginning and duration – normal, early and late floods (Figure 5.2). They stated that the normal flood duration was three to four months, from June to September. Such normal floods are expected by char-dwellers and they depend on them for irrigation for their agriculture. Around 60 percent of char-dwellers' primary livelihood directly or indirectly depended on these floods. However, they also often face irregular floods that are what is known as the early and late floods.

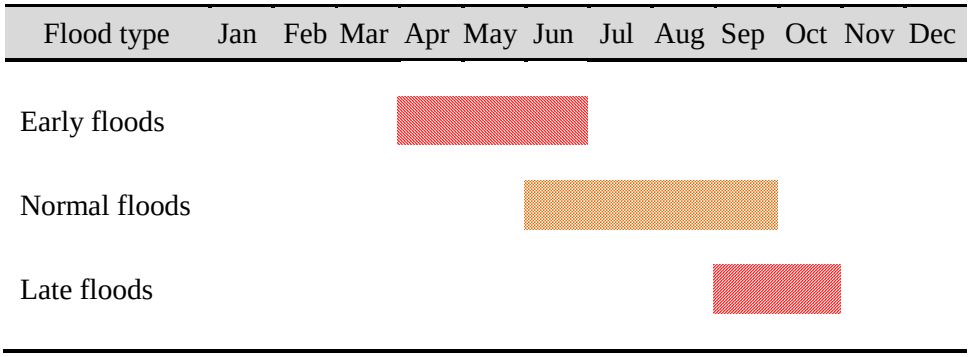


Figure 5.2 | Flood variability at Bonna village

(Source: from FGD session 2, fieldwork at Bonna village, March–May 2012)

Early floods occur in the month of April and remain until June and are usually the main consequence of substantial damage to Aush rice and jute. On the other hand, late flood may continue until the end of October. The char-dwellers cannot harvest their transplanted Aman rice or even deep-water rice, and they have to wait until November for planting winter crops. They added that though they faced abnormal floods previously, the intensity and frequency of early and late floods have been increasing over the last two or three decades.

The respondents also divided floods into four types in terms of their severity: severe, moderate, normal and low floods (Figure 5.3). Timeline analysis, a PRA tool, was used for collecting field data for understanding the longitudinal distribution of floods in terms of their severity over the last three decades. The respondents decided to indicate annual flood situations since 1984, as they were not able to provide flood data

beyond that time. Then they chose two recent severe floods (floods of 1998 and 2007) as baselines so that most participants would be involved in this session and express their own experiences and draw the lines for the other years (detailed in Chapter 4). Figure 5.3 illustrates how the intensity of different types of floods has been increasing since the 1980s.

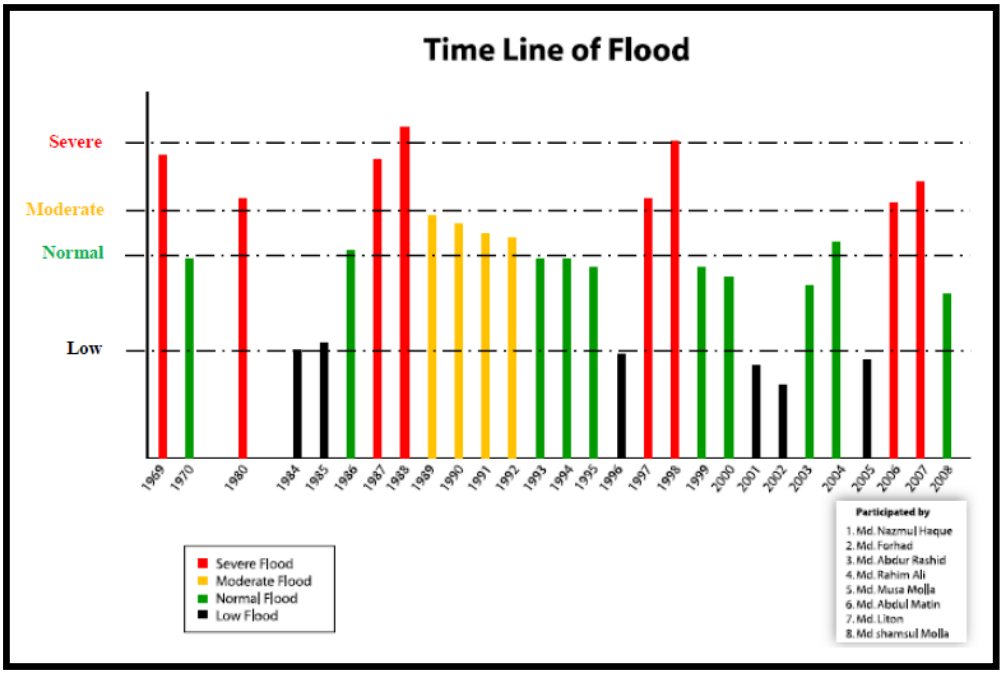


Figure 5.3 | Flood situation at Bonna village for last 30 years

(Source: from FGD session 2, fieldwork at Bonna village, March–May 2012)

Table 5.1 describes the characteristics of different types of floods identified by the participants at FGD session 2. The duration of severe floods varies because some events remain for more than one month and others are for only a few days. Often this flood starts in May and stays up to August-September. Sometimes it starts at the regular time but then prolongs up to November and sometimes remains as if normal floods. Usually severe floods inundate both agricultural fields, roads, settlements and other infrastructure. A moderate flood is often prolonged like a normal flood up to September but destroys nearly-mature crops in the fields. However, in these circumstances farmers can still plant winter crops and Boro rice.

Table 5.1 | Characteristics of different floods as reported by research respondents

Typology	Characteristics of life during and after floods
Severe floods	• Whole char including highlands under flood water • Minimum losses and damages of three-fourth portions of standing crop • Delay for planting next crop • Lack of livelihood opportunities • Extensive damage to infrastructure • Outbreaks of waterborne diseases such as cholera and diarrhoea • At least 50 percent people move to mainland • 100 percent dependency of relief and loans
Moderate floods	• Whole char excluding higher areas under flood water • 50 percent losses and damages of standing crop • Delay for planting next crop • Lack of livelihood opportunities • Moderate damages of infrastructure mainly earthen roads • Significance occurrence of waterborne diseases such as cholera and diarrhoea • Around 10-20 percent people move to mainland • Half of the char-dwellers depended on relief and loans
Normal floods	• Only lowlands are under water • No significant crop damage • Continuation of regular crop calendar • Availability of livelihood opportunities • Post-flood earth-digging jobs decreasing as no or little damage to infrastructure • No forced migration due to floods • No dependency on relief and loans except for vulnerable groups
Low floods	• Some lowlands may go under water for several days • Minimum 50 percent production losses of standing crop due to lack of irrigation • Sowing early winter crop • Lack of livelihood opportunities • No damage to infrastructure • Most people searching jobs in outside the char • Minimum 50 percent of people dependent on loans due to unavailability of relief

(Source: from FGD session 2, fieldwork at Bonna village, March–May 2012)

The duration of a normal flood is from July to September. Though lowlands are inundated, char-dwellers welcome these floods because they do not damage their Aush rice that is usually produced on higher ground and near settlements. Farmers, however, produce deepwater rice which can grow up to four metres so that it can cope easily with normal floodwater. Furthermore, normal floods bring nutrients for the soil so that it is suitable for agriculture for the next few years.

The respondents expressed their frustration at experiencing the low flood situation often referred to as a drought or Monga condition. Fig 5.3 shows that the number of low floods increased in the present decade (one and three events occurred in 1990s and 2000s respectively), though the number of severe floods is unchanged during the 1980s, 1990s and 2000s (two severe events occurred in each decade). The production of rice including local varieties falls during such events due to lack of sufficient irrigation. As for other areas of the country, the cropping pattern in the char follows the monsoon climatic system. Pre-monsoon crops need more irrigation compared to winter crops, which is fulfilled by rainfall and irrigation. The respondents claimed that as there was no proper irrigation system in their char, they were mainly dependent on rainfall and flood water. Therefore, in the year of a low flood, they get less natural rainfall and no flood water followed by failure of crop production. Nonetheless, during that period the farmers usually graze their cattle in barren fields until October when the sowing time of winter crops usually starts. The respondents agree that in such a situation they sow winter crops earlier for recovering recent losses. Finally, the respondents point out that the intensity of abnormal floods in terms of magnitude, volume and frequency, are increasing, though most of them do not know the exact cause of this. However, it was primarily elderly persons who expressed their views on how they are feeling about their local climate changing over time.

5.2.2 Observed impacts of climate change

IPCC (2007) stated that Bangladesh is one of the most vulnerable countries in the world in terms of exposure to present climate variability and future climate change. Evidence shows that the country has already observed some changes including temperature increasing by 1°C in May and 0.5°C in November during the period of 1985–1998 (CCC/GoB, 2008). Inter-seasonal and spatial variability of rainfall has been observed within last few decades (IPCC, 2007). Furthermore, several studies projected that the country will be exposed mores in the near future (Ahmed, 2006; GoB, 2009a). Community observations of climate change often differ from scientific projections at global scale. However, the government and NGOs are reshaping policies and planning for actions at local level influenced by these scientific projections without understanding the community perspective. This section analyses how the respondents of this study observe the existing changes and the next section focuses on what and how they predict their localised future threats. These sections

also explore whether their observations and predictions differ from existing scientific knowledge.

It was observed that the respondents of the study tried to relate the climate change issue to environmental hazards and disasters as they had experienced devastating floods and cyclones in recent times and the impacts of those events are still fresh in their minds. Most people from the coast and river islands of Bangladesh believe that their local hazard calendar is changing in terms of increasing frequency, timing and magnitude of environmental events that affect their lives and livelihoods.

> "People's vulnerability is increasing as the length of floods is increasing. Besides, river bank erosions are also increasing." (Interviewee 13: a member of local Union Council aged 58, Bonna village, March–May 2012)

This scenario suggests the impact of climate change as already projected by international scientists. Though local people's perception of climate change as an underlying cause is not clear, they have noticed the changes in their local environment in terms of their exposure to potential and actual disaster events. The respondents agreed that there is a negative relationship between disaster vulnerability and coping mechanisms indicating that if their vulnerability increases, their capacity to be resilient will be eroded. It is therefore important to know how local knowledge and coping mechanisms are shifting in the disaster – climate change context. This is examined in more detail in Chapter 6.

Senior citizens of the study areas in Jamuna river basin indicated that they were aware of underlying climatic factors, not just the river environment. They referred to the changing weight of disasters through associated economic costs.

> "I can feel temperature is increasing. I am not going to say rainfall is also increasing or decreasing but the time is changing. The numbers of early and late floods are increasing." (Interviewee 11: a senior citizen and landowner-cum-businessman aged around 70, Bonna village, March–May 2012)

Though his observation is qualitative and partially differs from most scientific projections, senior respondents like this one pointed out a fundamental issue of changing annual rainfall patterns often neglected by policy-makers and even occasionally by scientists. They raise it since this issue is very important for local agriculture and natural resource based livelihoods.

Regarding awareness of climate change and its impact, the local government and NGO staff claimed that they regularly discussed these topics at the community level. The participants of the FGDs also agreed that they had attended awareness building trainings and workshops on climate change. However, they found it difficult to follow what they say in trainings and utilise this new information in their daily lives. They indicated that they just lived with the uncertainty of disaster.

> Many rural people of Bangladesh cannot explain what climate change is and how they will adapt with this situation, though scientists have predicted that part of the country might be submerged just after a few decades due to a slight rise of sea level. His words are just one example indicating that the number and magnitude of disasters are increasing and that people's attitude changes after experiencing a severe disaster. Therefore, although local people's perception of climate change is not clear, they are aware of the changes in terms of their vulnerability to disasters. "Sidr cost us a lot that we never thought. Though Aila didn't damage to such volume, we were worried and ran away to the shelter. We are afraid of the increasing frequency of cyclones…. I don't know what climate change is. But we are afraid of the increasing frequency of cyclones." (Interviewee 4: a rice farmer aged 35, Sidr village, June–July 2012)

It was not possible to find any micro level scientific studies on how local climate is changing in that particular area to compare with the farmer's experience but some other senior respondents of the area also agreed with him. Further, international and national level scientists and researchers especially the IPCC Group highlight the same predictions several times in different forums and writings (IPCC, 2012, 2014).

Some social groups are more vulnerable to climate change and it is beyond their capacity to cope with this changing environment. Like the widow of Jamuna river basin, many people have forcedly migrated several times to new places with fewer livelihood opportunities. This type of forced migration is not only throwing them into the fragile conditions of a new environment but also exposing the existing vulnerable groups to more pressure as the job market becomes more competitive. This may not only increase social chaos through the local job market but also through access to common property and external assistance.

> "I lost my house eleven times in my life due to river bank erosion. Now I live in a thatched room on this embankment. Requiem of my life is immeasurable. I don't know how to adapt to the river. … I can't work; I am fully dependent on government and NGO support." (Interviewee 3: a widow aged 50 displaced from Bonna village to mainland area, March–May 2012)

> "A couple of decades ago we shifted our agricultural lands to shrimp farms for financial benefits and first few years we earned good but afterwards that spot disease occurred and salinity increased in our farms. People are saying that it is the result of climate change. We can't go back for crop farming. We don't know how to adapt to it. We need external assistance." (FGD session 9: group discussion with shrimp farmers, Aila village, July–August 2012)

The previous section reported that the local people easily perceive their localised hazards and the associated vulnerability of their lives. To understand the present vulnerability condition, they revisited the historical trend of floods and the impacts it had on their life. In this section, the local people, particularly elderly persons argued how they perceive climate change through their understanding of exposure and vulnerability to hazards and disasters. The next section will discuss how the experiences of environmental disasters and recent observation of climate change impacts assist the local people to perceive future climate risks.

5.2.3 Local respondent predictions of future disasters and climate change

All climatic factors such as temperature, rainfall, humidity and wind movement will change in future. There are many studies that have already projected future climatic threats to Bangladesh (Mahtab, 1989; ADB, 1994, 2012; BUP-CEARS-CRU, 1994; Ali, 1999; Ahmed, 2006; IPCC, 2007, 2012, 2014). These scientific studies claim that temperature and rainfall will increase and sea level rise may increase incidence of tropical cyclones and their related human impacts along the Bangladeshi coast. The respondents of the study were asked about their own predictions of future climate change impacts. Their perception regarding increasing cyclone risks is similar to scientific projections.

> "... Yes, I heard that frequency and impacts of cyclones will increase in future and I do agree with it. People also say that our sea will rise but I don't understand. But we, fishermen who catch fish in the sea, are not getting enough fish now. The people from the fisheries department inform us about the future challenges of fishing. If I won't catch fish in future, probably I shall have to look for a new job." (Interviewee 6: a fisherman aged 45, Sidr village, June–July 2012)

The understanding of the fisherman is influenced by his surrounding world and his livelihood strategy. Some studies claim that local people can identify and measure sea level rise and its impacts on their livelihoods (Agrawala et al., 2003). Though the fisherman might not observe the rising of sea levels as he claimed, he argued that his

livelihood is exposed to climate change. Evidence shows that the production of marine and freshwater fish is varied due to present climate variability and future climate change (Agrawala et al., 2003; Chowdhury et al., 2012). The government policy to protect the larger fisheries sector does not consider local fishermen's interests. With the aim of protecting endangered species and natural fish habitat, the government of Bangladesh has declared many fish sanctuaries and regularly celebrated a fish week, but failed to secure fishermen's livelihoods (GoB, 2007). Many fishermen like the above fisherman are worried about the future of their inherited livelihood strategy. Table 5.2 demonstrates that the char-dwellers of Bonna village are concerned about the present hazards as well as future climatic risks. The table indicates that the char-dwellers define their future climatic risks through their localised hazard specific understanding. Although the ranking of present hazards is reshuffled in terms of future impacts, they are primarily concerned with the frequencies and magnitudes of present extreme events.

It can therefore be appreciated that the char-dwellers define flood severity according to their magnitude (high floods and low floods also described as droughts), timing and duration (early floods and late floods). Further, they argue that the frequency of severe floods will be increased in near future. Early floods are ranked as a top concern due to their extensive associated agricultural and livelihood losses. Increasing frequency of severe floods and river bank erosion will be costly in future in terms of human coping. Both potential victims of future climatic events and local level development practitioners assumed future risks will be costlier to cope with.

Table 5.2 | Comparison between present and future climatic hazards

Present hazards	Ranking	Future hazards
Severe floods	**1**	Early floods
River bank erosion	**2**	River bank erosion
Hailstorms	**3**	Droughts
Droughts	**4**	Severe floods
Fog	**5**	Fog

(Source: from FGD session 2, fieldwork at Bonna village, February 2013)

Most local practitioners of the study area predicted that future disasters would increase vulnerability and reduce capacities at individual, household and community level. Coppola (2006) argues that, apart from increasing frequency and magnitude of future disasters, they will be costlier, particularly in the developing world.

> "Future floods will be costly. The river [Jamuna] is becoming more unpredictable and eroding more char-lands. I am afraid to think that the char where we are at this moment may be disappeared. It is the result of climate change." (Interviewee 17: an NGO staff aged 43, Bonna village, March–May 2012)

The NGO staff indicated that the degree of uncertainty would increase; and the life and livelihoods of the char-dwellers might be exposed to higher risk. He also added that river bank erosion was another vital issue for their life and the existence of the char due to the complex geomorphological characteristics of river Jamuna. Evidence shows that this braided river has many char-lands throughout its flow created by a complex interaction of siltation and erosion processes (Brammer, 2004). The perception of the NGO staff is not only based on his experiences but also influenced by his higher authority. It was observed throughout the field study that a common tendency of both the government and NGO staff at the community level in Bangladesh is to try to make the link between climate change and recent disasters in their own locations. In the same manner as local people noted above, they are informed in training and workshops regarding climate change and its impacts on their relevant sectors including hazard and disaster patterns and trends.

> "Climate is changing due to our activities; we extract natural resources haphazardly. In future the scenario will be the worst. We need to do something immediately to solve the problem." (Interviewee 15: a school teacher aged 56, Aila village, December 2012)

The school teacher made similar comments to the previous two respondents regarding climate change and its observed and projected impacts. However, the school teacher pointed out human activities including rampant utilisation of natural resources are the primary cause behind climate change impacts, which is also supported by the IPCC group and scientific research (IPCC, 2012, 2014). Population growth, particularly in developing countries, accelerates higher pressure on natural resources and creates societal conflict in this way (Schnurr and Swatuk, 2012). The respondent assumed that the conflict situation will be complex, if it is not possible to control now. He indicated

"effective solutions" related to IPCC driving two wider approaches such as 'mitigation' and 'adaptation' to reduce climate change related risks. IPCC and many studies often refer to adaptation for the developing countries as many of these countries are primary affected by natural climate variability and anthropogenic climate change (IPCC, 2012, 2014).

The above respondents predicted that the impacts of climate change will be more adverse in the near future based on their recent observations and experiences. Their predictions are primarily related to their localised hazards and disaster exposure, and the vulnerability of their livelihoods. Therefore, it is important to understand the interconnectedness of localised vulnerability to disasters in a changing environment.

5.3 Deconstructing people's vulnerability to disasters and climate change

Early hazards and disaster studies employed a human ecological approach predominantly driven by geographers to understand how people and societal organisation adjusts with the nature of natural hazards (Barrows, 1923). In more recent times, particularly since 1970s, the scholarly community has been not only analysing hazards and disasters but also exploring the notion of vulnerability (Cannon, 1994). Evidence shows the need to analyse integrative vulnerability such as social-ecological, socio-economic and related aspects as a paradigm of hazard and disaster studies (Turner, 2003; Eakin and Luers, 2006). Multi-dimensional vulnerability is a further trend in vulnerability studies (Bollin, 2003; Birkmann, 2006; Kienberger, 2007). This holistic and dynamic approach not only explores the multiple dimensions of vulnerability but also focuses on temporal and spatial analyses (Cardona, 1999, 2001; Turner et al., 2003; Birkmann, 2004). People's vulnerability often fluctuates in different places over the years due to environmental change.

Figure 5.4 represents how temporally and spatially people's vulnerability is driven by international, national and local change. Here the international system includes the work of the international scientific community, multilateral and bilateral international agreements, policies of foreign governments and development partners that have an influence on local level vulnerability to environmental disasters and climate change. National systems influence how localised vulnerability is powered by the government policies, plans and functions as well as NGO movements. Social systems, norms and cultures and power structures at local level may also expose local people to hazards

and disasters and climate change. The present study also highlights how people's vulnerability can differ due to spatial variability.

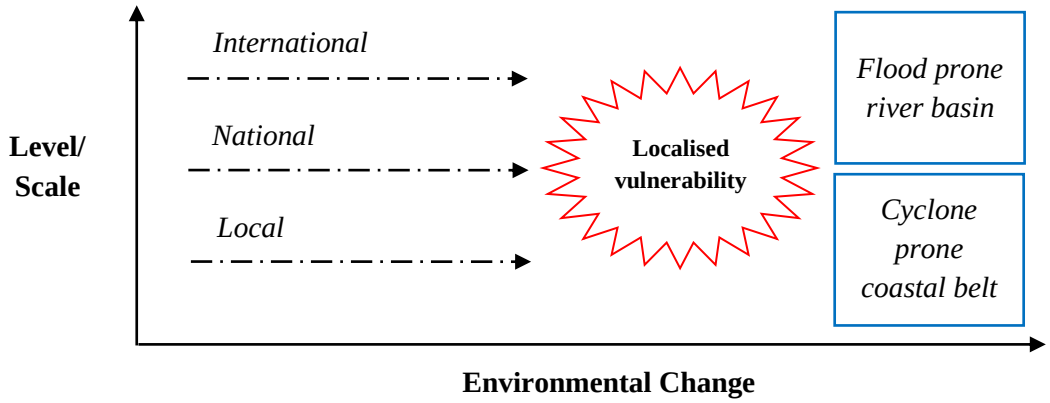


Figure 5.4 | Multileveled understanding of people's vulnerability with environmental change

(Source: Author)

Apart from understanding temporal and spatial vulnerability, this study had to consider multiple dimensions of vulnerability including environmental, political, economic and social aspects. Table 5.3 reveals how people's multi-dimensional vulnerability at local level is influenced by international, national and local systems. This understanding has been derived through both reviewing existing literature and analysing empirical findings allowing the rest of this chapter to explore the multiple dimensions of vulnerability to environmental disasters and climate change.

Table 5.3 | Multiple dimensions of localised vulnerability in Bangladesh from a DRR-CCA perspective

Level/scale	Dimensions of vulnerability to disasters and climate change			
	Environmental	**Political**	**Economic**	**Social**
International	Global warming Sea level rise Increasing frequency & magnitude of disasters	Globalisation Global agreements (Adaptation strategy, bio-fuel debate, HFA2) Poor regional cooperation (e.g. Farakka Barrage)	Globalisation Instability in international trade Shifting paradigm from 'humanitarian fund' to 'climate fund'	Globalisation
National	Land degradation Submerged due to SLR Increasing large-scale disasters	Political commitments National policies (e.g. DRR, CCA) Lack of cooperation between the government & NGOs activities	Instability of agricultural production Economic inequality Regional disparity	Poverty Overpopulation Unplanned urbanisation Inappropriate social safety net programmes
Local	Remoteness Expose to localised disasters Seasonality Natural resource dependency	Local politics Unfavourable atmosphere for Local Governments	Remoteness Lack of marketing Poverty & homelessness Instability of agricultural production Rural-to-urban migration	Poverty Individual generic factors (e.g. age, sex) Social inequity Influence of institutions Division of labour

(Source: Author)

Social systems and structures often play a major influence on determining people's accessibility to local resources and services, and in exposing them to hazards, environmental disasters and climate change. Social vulnerability often interlinked with other factors such as environmental, political and economic vulnerabilities.

Environmental vulnerability is often referred to as ecological vulnerability because of its focus on the exploration of ecological or ecosystem change (Holling, 1973; Gunderson et al., 1995). In the context of hazard, disaster and climate change studies, environmental and ecological vulnerability is often considered in terms of how ecosystem and human-ecosystem interrelationships are exposed to hazards, disasters and climate change (IPCC, 2012). Here environmental vulnerability to disasters and

climate change is explored in terms of how the local people of the study areas are exposed due to subsisting in places easily affected by natural hazards and seasonality, and their dependency on nature for a means of living and survival in an emergency.

In this study political vulnerability means how political instability, policies and structures at different levels (from international to local) influence society and environment. Thus, political vulnerability is often referred to in the context of a 'political ecology' perspective on human-environment relations (Wolf, 1972; Blaikie and Brookfield, 1987; Walker, 2005). Robbins (2004) argues the policies and actions of international and national stakeholders often control international trade and markets that has negative impacts on localised markets and people's livelihoods. International and national politics and policies transform people's life and livelihoods, mediated by their access to opportunities through localised power and institutional structures.

This study economic vulnerability critically analyses how international and national economic policies and strategies influence localised disaster vulnerability. Besides, local economic activities and distribution of resources and services are also responsible for determining economic vulnerability. The Committee for Development Policy (CDP), an advisory body to the United Nations Economic and Social Council (ECOSOC), mentions seven indicators in an Economic Vulnerability Index for measuring economic vulnerability of developing countries (UN, 2014). These include: population size; remoteness; merchandise export concentration; share of agriculture, forestry and fisheries in gross domestic product; homelessness owing to natural disasters; instability of agricultural production; and instability of exports of goods and services. It is generally known that Bangladesh is famous for overpopulation throughout the country including in river chars and coastal belts. Therefore, it is necessary to understand how these indicators are influencing local people's social vulnerability to environmental disasters and climate change.

5.3.1 Social vulnerability by geographical location

Suitable coastal locations were commonly the first point of contact between native people and colonisers in Asia, Africa and Latin America, which helped those places become major urban centres through creating new livelihood opportunities (Franke and Chasin, 1980; Wisner et al., 2004). After their development under the colonial regime, those cities attracted migrants from inland areas forcing large numbers of new

settlers to live in areas at high risk of tropical cyclones (Eckholm, 2003; Wisner et al., 2004; IPCC, 2012). In Bangladesh, historically many ports and townships were built along the coast and major rivers. At present the normal rural-urban migration pattern of the country is to Dhaka, the capital city with a more than 12 million population size within 500 km^2, followed by Chittagong, the principal seaport with around five million people (BBS, 2013). Though the Chittagong coast including the city offers new jobs to outsiders, other parts of the Bangladeshi coast, particularly from Satkhira to Noakhali are still underdeveloped. Thus, many people from the study areas (Sidr and Aila villages) migrate, particularly to Dhaka city. The study village of Jamuna river basin (Bonna village) is regularly exposed to floods and river bank erosion due to the influence of expansive Jamuna River and through soil deposition. Forced migration is a common livelihood strategy for the river char-dwellers (CLP, 2013). These geographically remote areas are often neglected by national services and facilities. Though the government has already declared Chauhali as a remote Upazila, other two study Upazilas are also generally considered as remote areas (GoB, 2013). Apart from some special package programmes implemented by the government and NGOs, it has been observed by seemingly everybody from the local residents to the national press that these areas were overlooked during emergencies.

5.3.2 Impact of seasonality

Seasonality has a great impact on local people's lives including agricultural production, food security and rural livelihoods, particularly in Jamuna river basin (Chambers, 1982; Brammer, 2000; Devereux et al., 2008). To identify the impact of seasonality, first it is important to define 'season'. In Bangladesh, seasons are often divided in terms of crop calendar, namely Kharif–1 (pre-Kharif), Kharif–2 (Kharif) and Rabi (winter) (DAE/GoB, 2013). Farmers of the country commonly call these seasons by the main rice variety of each season such as 'Aush season', 'Aman season' and 'Boro season', respectively. Sometimes the char-dwellers divide the seasons based on a hazard oriented calendar as was reported through Table 5.1.

In analysing vulnerability, the respondents used a Bangla term *Auvab,* for which the closest meaning in English is scarcity. They defined scarcity as such a condition when most char-dwellers have not enough quality food to survive and they are largely depended on external relief and loans. *Shukher Somoi* (time of happiness or felicity) is another term they used to describe the opposite condition of scarcity. The literal

meaning of felicity varies from how the char-dwellers defined it. Understanding of felicity by the people of other regions of Bangladesh may differ. The respondents of the study identified felicity as such a situation when most people have sufficient food at their home for few months and they can survive without external assistance.

The flood situation varies with season that directly relates to the time of their scarcity and felicity (Figure 5.5). In a normal flood year, scarcity is experienced for a maximum four months (mid-June to mid-November). If people can harvest Kharif crops including Aman rice and plant their desired winter crops in time, the next couple of months (mid-November to mid-January) are considered as 'felicitous months'. After mid-January the household food stores of many respondents are gradually being depleted and the time of survival starts. Thus, the next four months (mid-January to mid-May) are considered as the months of survival. However, the well-off families still have sufficient food to live in a modest way. Conversely, the poor often start to take loans from relatives and neighbours from February with the hope of a standard yield of pre-Kharif crops including Aush rice. The second felicitous period begins in mid-May in a normal flood year and continues until mid-July. If a severe flood occurs during June to October, the time of scarcity is for a longer period and remains until mid-February because of losses and damage of standing crops and delays in winter crop plantation. For the next three months (mid-February to mid-May), most of the respondents survive primarily through external assistance and internal loans.

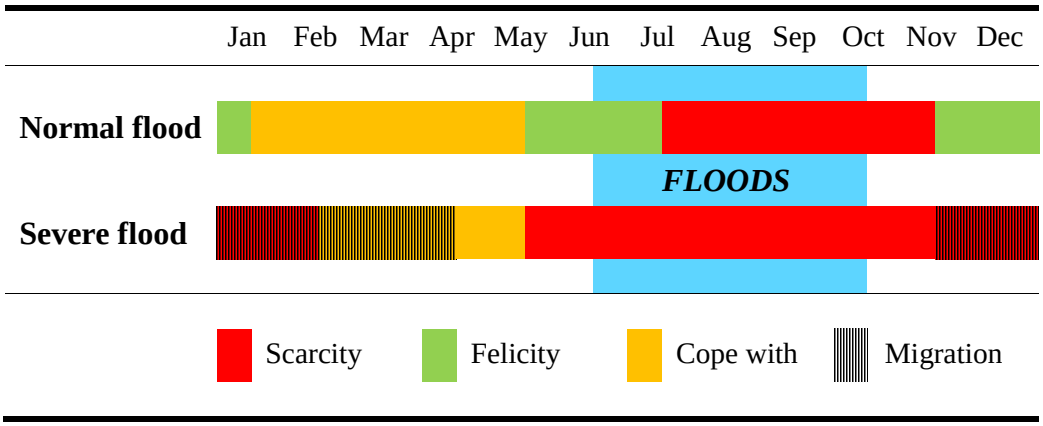


Figure 5.5 | Interaction between seasonality, flood and scarcity of the char-dwellers of Bonna village

(Source: from FGD session 3, fieldwork at Bonna village, February 2013)

Unlike the perpetual situation of chronic poverty amongst many societies in the developing countries, local people's experience of poverty in these study areas fluctuates season-by-season (Dercon and Krishnan, 2000). Living in such a place that is easily exposed to natural hazards and seasonal variability subsequently may increase local people's vulnerability. Figure 5.6 illustrates how char-dwellers' vulnerability to floods fluctuates due to seasonality. The respondents of the group discussion (FGD session 3) used jute sticks on a brown paper to measure and compare their monthly vulnerability both in a normal flood year and a severe flood year. They used Bangla calendar that starts from 14 April and they included farmers that follow it in their day-to-day life. Firstly, they chose the month (*Ashwin* – from 16 September to 15 October) when they experience highest vulnerability in a normal year and then determined other months. After that they measured and drew lines for a year of severe flood.

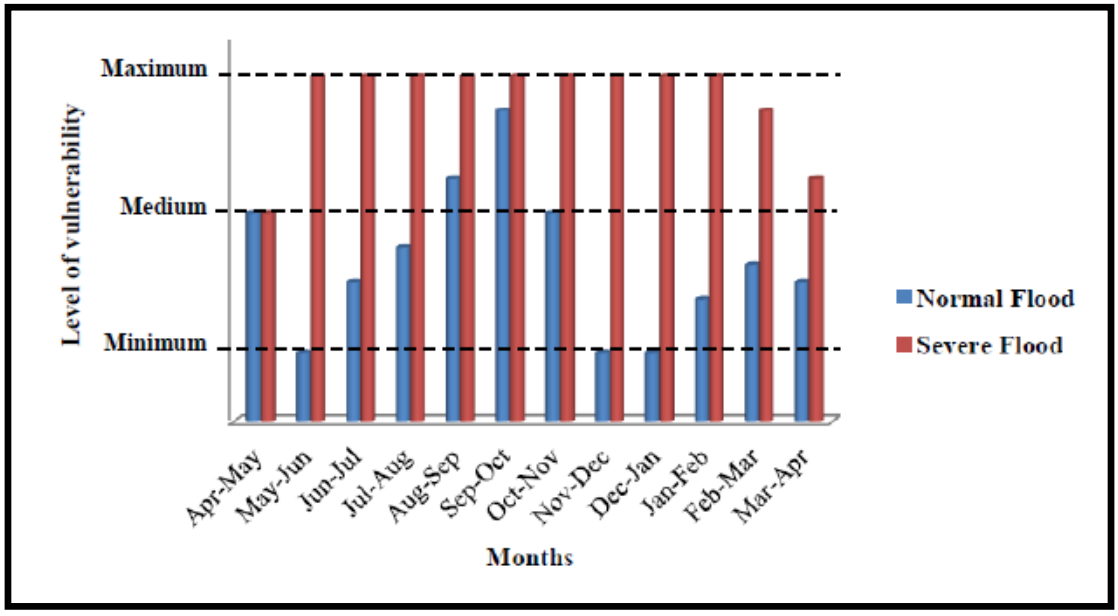


Figure 5.6 | Impact of seasonality and people's vulnerability at Bonna village

(Source: from FGD session 3, fieldwork at Bonna village, March–May 2012)

Maximum vulnerability is experienced over the year except two months (mid-March to mid-May) if a severe flood occurs due to losses and damage of standing crop and lack of local jobs. However, in a normal year, char-dwellers' vulnerability fluctuates over the year. They face severe problems for three months (mid-August to mid-November) of a normal year due to depleted stores of rice and minimal alternative

livelihood opportunities. As farmers plant Kharif crop including Aman rice and need to wait until *Agrahayon* (mid-November to mid-December), agricultural wage workers are not offered any job in crop fields. The respondents pointed to the situation as *Akal* (extreme scarcity) and *Auvab* (scarcity) commonly in a severe flood year and a normal flood year, respectively. However, in a normal year, they may face Akal situation if they experienced a severe flood the previous year. Though they claimed Ashwin is the month of the highest vulnerability or scarcity, the season is also called *Mora Kartik* (deadly Kartik – mid-October to mid-November). This is because nowadays the government and NGOs take initiatives such as creating seasonal local employment to reduce people's vulnerability. Besides, many char-dwellers manage jobs at nearer towns as daily commuters or migrate seasonally to Dhaka and Chittagong for 2-3 months. This special period of hunger and starvation is also termed as *Monga*, particularly in the development field of influence, though the term originated in northwestern Bangladesh as a local colloquial word (Elahi and Ara, 2008; Ansari, 2013).

From the month of Agrahayon vulnerability gradually decreases as, meanwhile, the char-dwellers can harvest their field crop. This is the month of *Nobanno* (Bengali harvest celebration) when farmers have sufficient rice for the next one year or few months, and wage workers can earn cash for harvesting Aman rice and planting winter crop. The second Auvab or Monga period starts from the beginning of April because of the lack of agriculture-based job opportunities. However, the duration of this period is around one month due to high migration to Dhaka and earth digging employment opportunities. Though the introduction of irrigation and HYV Boro rice creates new jobs in some northern districts, the Bonna village is not well irrigated due to its geographical isolation from the mainland.

5.3.3 Natural resource dependency

Natural resource-based communities are often exposed to natural hazards and disasters through the distinctive interface between environment and society (Gaventa, 1980; Humphrey et al., 1993; Krannich and Luloff, 1991; West, 1994). These natural resources include agriculture, forests and wetlands. In Bangladesh, though the contribution of the agriculture sector to GDP is just less than one-fifth (19.3%), still around half of the whole population of the country (47.5%) are involved in this sector (BBS, 2012). In Bonna village, the respondents claimed that at least 60 percent of

them are directly involved in the agriculture sector. They further added that they are easily exposed to floods and river bank erosion due to their dependency on natural resources. In Sidr village, the farmers lost their standing crops to Sidr and Aila. Beside, the local fishermen community claimed that the amount of fish caught in their nets was gradually decreasing. The respondents of Aila village stated that all rice fields in their area were converted into shrimp farms within the last few decades. Such natural resource dependency has already generated livelihood related vulnerability in the study areas. Natural resource dependency may create a threat to people's skills and knowledge.

> "I was a sharecropper before these lands were converted from rice fields to shrimp farms. I just know how to plough land and cultivate rice. I don't want to work at shrimp farms as a wage worker that can hamper my prejudice in my locality. However, now I work at a brick field near Dhaka. (Interviewee 10: a migrant worker aged 50, Aila village, July–August 2012)

The sharecropper has not been using his rice production related knowledge, experiences and skills since the lands converted into shrimp farms in his area. He argued that shrimp farming not only decreased his knowledge and skills of rice cultivation but also his entitlement to be a rice farmer. As he did not have his own cultivable land and did not wish to work on shrimp farms, he had to migrate to Dhaka to search for a job and left his family behind. The statement of the fisherman given below indicates that people who are dependent on natural resources and vulnerable to natural hazards, want to continue their livelihoods and recover the losses. Therefore, they may increase other vulnerabilities such as living with food insecurity and poor housing conditions.

> "... After Sidr, I had to repair my boat but that was a new one." (Interview 6: the fisherman, Sidr village, June–July 2012)

> "We are dependent on nature for different purposes. We also collect fodder and domestic fuel. But it is difficult to collect fodder and fuel during floods. Men do nothing; we women and our children do it." (Interviewee 2: a housewife aged 32, Bonna village, March–May 2012)

The housewife belonged to a male-headed family and described how such a dependency on nature prompts gender sensitive vulnerability to disasters. The char-dwellers of Jamuna river basin are fully dependent on nature for collecting livestock fodder and domestic fuel. As the division of labour driven by a male dominated rural

social system in Bangladesh gives women and children responsibility for collecting fodder and fuel over the year, sole dependency on these natural resources for fodder and fuel can bring additional vulnerability for them.

5.3.4 Globalisation and international agreement influences on farming systems

This section focuses on the relationship between globalisation and environmental disasters and how this political dimension influences local people's livelihoods and creates social vulnerability. Newell (1999) argues that globalisation is often taken as a byword for any activity which extends beyond sovereign borders in the economic, political, social or cultural domain. It can be defined as the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa (Giddens, 1990).

Shrimp farming in the coastal Bangladesh is a consequence of globalisation due to substantial amount of demands for shrimp in the restaurants of the western world (Rahman, 2003). At the primary stage, it created some new livelihood options through the production, processing and marketing of shrimp (Pokrant, 2001).

Shrimp farming benefits local elites who are practicing this activity at a large scale and are aligned with local level power structures. The practice not only has rampant negative impacts on the natural coastal environment in the long run but also affects the indigenous and inherited livelihoods of the local poor as most agricultural lands in some zones were converted into shrimp farms. Furthermore, environmental disasters through river bank erosion, saline intrusion and cyclone Aila compounded the situation.

> "Businessmen are making money sitting in Dhaka and Khulna. We, the farmers, are worried about our shrimp farms. We heard that Europe and America is not interested in importing our shrimp due to spot disease... but we can't go back rice farming as our soil is not suitable for agriculture due to presence of high salinity." (Interviewee 8: a shrimp farmer aged 42, Aila village, July–August 2012)

> "Production is gradually falling off due to saline water. We are losing our job. Many workers left the village to Dhaka but I do not want to move. I want to live in my village but I have no hope." (Interviewee 9: a wage worker at shrimp farm aged 36, Aila village, July–August 2012)

It was observed that globalisation, enacted here through shrimp farming, and environmental disasters together influence increasing vulnerability in a phased manner. Firstly, a large number of the local sharecroppers, who were usually landless or marginal farmers, refused to work as wage workers due to their local prejudice and migrated to Dhaka and other urban areas to search for jobs in informal sectors (e.g. working at brick fields or construction sites) (Section 5.4.3). Secondly, short-cuts through embankments for easy supply of saline water to shrimp farms made river embankments more vulnerable to erosion, resulting in further loss of land and consequent forced migration. Thirdly, some wage labourers also lost their jobs because of reduced production resulting in even more uncontrolled use of saline water in shrimp farms. The above statements by the farmer and the worker point to the uncontrolled usage of saline water that has generated spot disease and decreased production which creates a threat to international exports for the western world, the primary market of their product. Finally, Cyclone Aila triggered vulnerability due to sudden loss of livelihoods related to agricultural production including fisheries, poultry and shrimp. Chapter 6 will pick up on this further by critically analysing how the local people cope with "the politicised environment" that has been created (Bryant and Bailey, 1997).

5.3.5 Regional cooperation and geopolitics impacting on Bangladesh environment and livelihoods

Apart from its international membership, regionally Bangladesh is a member of the South Asian Association for Regional Cooperation (SAARC), the Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) (GoB, 2014). However, evidence shows that bilateral relationships of the country, particularly with its neighbours are essential not only for economic aspects such as internal and international trade and communication but also for environmental and social protection. The diplomatic relationship with neighbouring Myanmar is warm except for two disputed issues such as the presence of Burmese Rohingya refugees in Bangladesh and the demarcating of the international boundary between the two nations along the river Naf and its estuary (US Department of State, 2010). The refugees, particularly those who are illegal and live outside the UNHCR camps are involved in deforestation processes including in reserved forest areas for building their houses (UNHCR, 2007). The UNHCR report argues that the refugees are often

underpaid due to their lack of legal rights to work in Bangladesh. This makes the job market more competitive for the local Bangladeshis. The Burmese border force rejects Bangladeshi fishermen's rights to catch fish in the river Naf due to the dispute between the two nations, which hampers their legitimate right to a livelihood (Natunbarta, 2014).

In the case of the bilateral relationship between Bangladesh and India, both countries have shared a long cultural, political and economic history. However, the relationship is often affected by disputes including the construction and operation of the Farakka Barrage; sharing water of all international rivers; land-swap; swapping of 162 *Chitmahals* (enclaves) and adversely possessed lands[4]; disputed land and maritime boundaries including South Talpatti Island[5]; trans-boundary terrorism; illegal Bangladeshi immigration into India; frequent border killings by Indian border troops and so on (Bhaskar, 2005; Human Rights Watch, 2010). Evidence shows that the Farakka Barrage has been increasing hydrological and geomorphological problems in Bangladesh including: a fall of the groundwater table; increasing the likelihood of desertification progression in the north-western region; drying tributaries of the Ganges; increasing siltation process on riverbeds and salinity in the coastal region due to withdrawning water from the River Ganges especially during dry seasons. The construction of the barrage neglected the international laws and agreements of water management and distribution (Begum, 1987; Mirza et al., 1997; Mirza, 1998; Hofer and Messerli, 2008). It was observed that though there was no direct impact of the Farakka Barrage in the Jamuna river basin, the respondents of the coast claimed that the barrage is one of the primary reasons for increasing salinity in their areas.

> "The Farakka is the cause of increasing salinity. The rivers have been dried and now saline water is coming from the sea into our rivers." (Interviewee 16: a female member of the local union council aged 38, Aila village, July–August 2012)

> "Climate change is increasing the risk of cyclones and sea level rise. If the sea rises, the water of the rivers of Bangladesh will be salinised. However, the rivers are already being dried due to withdrawing water by the Farakka

[4] Recently the Government of the People's Republic of Bangladesh and the Government of the Republic of India exchanged the enclaves and adversely possessed lands under the Land Boundary Agreement, 1974 and the Protocol, 2011, and the agreement was implemented from the 1st of August, 2015 (GoB, 2015c).

[5] The Arbitration Tribunal on the India-Bangladesh Maritime Delimitation set up under the Permanent Court of Arbitration in The Hague delivered its ruling on 7th July 2014, in the matter of the Bay of Bengal Maritime Boundary Delimitation between the two countries (RT Network, 2014).

> Barrage." (Interviewee 18: a local female NGO staff aged 46, Sidr village, June–July 2012)

The statements of both local leader and NGO staff regarding the negative impacts of the Farakka Barrage on the southwestern part of the country are alarming in terms of increasing salinity in rivers directly connected to irrigation for agriculture and shrimp farming and their daily needs. If their agriculture and shrimp farms are affected by salinity, it will hamper their means of livelihoods which accelerate the present forced migration patterns. Fragile bilateral relationships and regional cooperation may therefore increase people's vulnerability at local level including the people of the southern part of Bangladesh.

5.3.6 National policy impacts at local level

The Cabinet Division of the Government of Bangladesh is the central decision-making authority for the entire planning, implementation and monitoring functions taken by the government through its ministries and departments (GoB, 2014). Though the country has three-tier local government systems, namely Zila Parishad, Upazila Parishad (UzP) and Union Parishad (UP) (detailed in Chapter 3), evidence shows that these local governments are able to rarely practise their legitimate administrative and financial power and functions (CPD, 2002). Besides, the government often takes the major decisions even for local level planning and actions by-passing the relevant local governments.

> "The [central] government does not look at the local problems. They decide themselves without consulting us but, to be honest, we live here; we know the local problem and how can solve the problem. But who cares? (Interviewee 13: the local leader, Bonna village, February 2013)

According to the statement of the above local leader, it is understood that the decisions for local level activities taken by the government often fail to resolve localised dilemmas because the higher authorities take their decisions generally for a larger geographical area, often for a district or even for the entire country. Besides, it often fails to understand and make decisions on a common issue due to insubstantial inter-ministerial cooperation within the government and beyond it, particularly with NGOs (UNDP, 2009). The next respondent (a local level NGO member of staff) stated that there was poor professional linkage between the government departments,

local governments and NGOs at local level, which affected community-based action planning for disaster management.

> "The government officials often neglect us; so why do the local politicians bother us? ... There should be a [cyclone] shelter at the southern part of the village as this area affected first by cyclones like Sidr in 2007. But there is no such shelter. The people who lived there are poor and vulnerable to cyclones. Actually they need a shelter. The embankment has become fragile after Sidr hit. (Interviewee 18: the local female NGO staff, Sidr village, June–July 2012)

There was no CPP managed cyclone shelter in the village before Sidr hit. The only cyclone shelter in the study village is a local branch office of Grameen Bank situated in the north-central part of the village where the most comparatively well-off families lived. According to the respondent, the people who live in the southern part of the village are poor and vulnerable to cyclones due to not only the absence of a shelter but also due to the fragile condition of the embankment along the river Boleswer. However, it was observed that plans were being made to construct a new shelter in the southern part. This scenario indicates that the poor decision-making processes of the government and higher authority of NGOs that often fails to realise the localised problems and people's needs. Some decisions are taken without considering their needs and vulnerability and others are taken after severe events when those are covered by national and international media and indeed local elites dominate the decision-making processes regarding how to implement DRR initiatives.

5.3.7 Shifting from local village politics to localised (national) party politics

In Bangladesh, 'village politics' is a commonly used terminology, particularly in urban areas. The urban young generation primarily based in Dhaka city use the term meaning the doing of something wrong intentionally against someone and creating problems and conflict amongst others. It was observed at the study areas that nowadays the villagers also used the term in a negative sense. However, generally rural political systems of Bangladesh are localised and in most cases, local politics often inheritably controlled by local elites. There are few earlier ethnographic studies on how political views and norms of villagers are influenced by their culture and socio-economic conditions (Mukherjee, 1958, 1971; Zaidi, 1970; Islam, 1974). After the abolition of colonial Zamindari systems, the concept of basic democracy by the then military autocrat General Ayub Khan (1958-69) was coined for devolution of

local leadership (Islam, 1974). He recounts that locally prominent kin groups often called a "surplus farmers" class took over the control of local politics heavily influenced by Islamic ideology and code of conduct, which gave gigantic power to religious leaders, but poor access to peasant groups as a result of increasing numbers of landless families and forced migrants. Local politics was rarely influenced by national party politics; however, during the 1980s many government officials and military personnel as well as other professionals such as businessmen, union leaders, lawyers and religious leaders, based in urban areas but who had strong connections with villages, were involved in party politics at different strata from the national parliament to local government systems (CIA, 1988). Though legislatively local government elections are free from party politics till 2016[6], it is heavily influenced by national party politics and voters often cast their vote at local government elections in terms of their own political views.

> "Our villages are divided between Awami League and BNP[7]. If the Chairman and Members to the local governments are from the opposition party, they are often neglected by the national government and local government officials." (Interviewee 14: a local leader aged 44, Sidr village, June–July 2012)

The statement of the above respondent highlights how national party politics has infiltrated in rural lifestyle and local power structures. It is understood from his words that the political party formed the (national) government patrons for creating its own local muscle groups (influential gang like groups) who often control the local power structure violating legitimate rules and regulations even in the areas where the politicians allied with other political parties were elected in local elections. Besides, those muscle groups control the functions and decisions of government departments at local level including relief and other disaster management and climate change activities. This scenario is not suitable for local level planning of actions for DRR and CCA or the selection of proper beneficiaries or sites of major infrastructures. Such biased politics have already seized local people's right to social benefits and means of livelihoods, and may worsen the situation in the near future.

[6] Since 2016, the Chairman election of every local government has nominated by the national parties, though the nomination of ward members and councilors are still free from party politics (ECB, 2016).

[7] Bangladesh Awami League and Bangladesh Nationalist Party (BNP), the two major political parties in Bangladesh formed the national government since 1971 except 11 years (1981-1990 and 2007-2008), have strong influence to the grass root level including a large vote bank.

5.3.8 Remoteness

Remoteness is an important aspect of economic vulnerability that influences local livelihood activities and services. In general, the study areas of this research are categorised as remote areas. Chauhali upazila is one of the 18 remote and underdeveloped Upazilas (excluding Chittagong Hill Tracts) declared by the government (GoB, 2013). Though the government staffs receive extra incentives for working in those areas, they often do not want to go there due to lack of services and amenities. This was made clear in the speeches of the local Imam at Chauhali Upazila and the local female politician at Ashashuni Upazila. The Imam also added that the prices of daily necessary goods are higher in the char-lands of Jamuna river basin because of high transportation cost. It was observed that only three grocery shops did a monopoly business at Bonna village and the poorer char-dwellers suffer because of this. The participants of the FGD sessions argue that the prices are often raised during flood periods, which accelerate their vulnerability to food security.

Some remote areas are neglected by government service providing systems. It was also observed that there were embankments on the mainland side along the River Jamuna but in the study char-land there was no embankment. The local government officials explained that permanent embankments are not viable in char-lands due to its sandy soil formation and high proneness to river bank erosion. Thus, the development activities of the char are mainly reactive including post-flood infrastructural maintenance works which create few local level job opportunities.

> "We are detached from the rest of the world. We can't get all necessary goods in our local market when we need them. Even sometimes those are available but we need to pay extra money due to high transportation cost. ... We hardly get government services. However, local leaders try their best I think but they can't do any better deal with higher authority of district level and in Dhaka." (Interviewee 12: the Imam of a local mosque aged 48, Bonna village, March–May 2012)

> "We hardly receive government services. Though it is an Upazila headquarter, most government staff live at Satkhira town due to lack of necessary facilities. ... Before Aila we informed the authority for repairing the embankment but no one bother us as we live in periphery. We didn't count such economic losses if the embankment would be repaired in time." (Interviewee 16: the female member of the local union council, Aila village, July–August 2012)

Likewise the previous participant, the local female leader argued that they realised their local embankment was fragile to Aila but the authority did not pay attention even though they informed them in time. She, being a local politician, identified that their area is always receiving least attention due to remoteness. According to her speech if the embankment had been repaired before Aila hit her village the local people would not have experienced such extensive socioeconomic losses and damages.

5.3.9 Homelessness owing to environmental disasters

Displacement is a common feature of the people who live in flood and river bank erosion prone areas (Baqee, 1998). However, apart from natural phenomena, socioeconomic strata are vital phenomena for determining the trend of displacement. Table 5.4 illustrates that the rich and middle class respondents were displaced 0-3 times in last 20 years whereas the number of displacements is higher in the case of the poor and extreme poor. It was observed at Bonna village that the poor and extreme poor are often displaced due to their poor housing condition. Their houses are also affected by floods and river bank erosion first because of the lower height of their home plinths.

Table 5.4 | Number of displacements recounted in relation to socio-economic condition of respondents of Bonna village

Socioeconomic condition of respondents' families	Number of respondents	Number of displacement in last 20 years (Mean)
Well off	3	0 – 2 (1.0)
Middle	3	2 – 3 (2.7)
Poor	3	3 – 5 (4.0)
Extreme poor	3	5 – 6 (5.3)

(Source: from FGD session 3, fieldwork at Bonna village, February 2013)

Most respondents of Bonna village (5 out of 6) who earlier lived in different chars of Jamuna River migrated there in the last two decades. Though their present houses are situated above the regular flood level, the housing conditions of the poor and extreme poor are fragile and unhealthy which is supported by the accounts of the homeless people. This respondent was not only forcedly displaced to an unhealthy housing condition on a river embankment but also lost his inherited livelihood strategy.

> "I lost my home and land in the river. Now I live in this embankment. The houses in a line you see of the landless people like me. Look where you now see the water of the river, I had my own lands. I was a farmer; now pulling a rented van." (Interviewee 1: a homeless person lived on an embankment aged 38, Bonna village, March–May 2012)

Rapid onset events such as cyclones also primarily damaged houses owned by the poor and extreme poor. Table 5.5 shows Sidr fully destroyed 72.2 percent of the respondents' houses and the poor and extreme poor were those who experienced it the most. The table demonstrates that 30 respondents out of 33 who belonged to the poor and extreme poor families completely lost their houses. Only three respondents claimed that their houses were partially damaged by Sidr amongst those who lived in the central part of the village. Conversely, only two respondents out of 11 who belonged to the middle class economic background lost their houses due to their location nearer the mouth of the River Boleshwer where the cyclone hit first.

Table 5.5 | Relationship between socio-economic strata and houses fully damaged by Sidr

Socioeconomic condition of respondents' families	Number of respondents	House fully damaged
Well off & Middle	11	2
Poor & Extreme Poor	33	30
Total	44	32

(Source: from questionnaire survey, fieldwork at Sidr village, June–July 2012)

> "Sidr destroyed my house and my neighbours' as well. I heard MuslimAid rebuilt some houses but nobody looked at me. I am living this unprotected house with my family. I am afraid to think what we will do if Sidr comes back again." (Interviewee 5: an agricultural wage worker aged 36, Sidr, June–July 2012)

A disaster event cannot only damage a property but also may put the poor in a more vulnerable condition. The quotation from the above respondent indicates that the Sidr survivors were unable to repair their houses because of their economic condition and temporarily lost their livelihoods after the cyclone. The housing condition has

deteriorated after Sidr and his family live in an unhealthy and poor housing condition. His words also indicate that external assistance partially failed to reach some of the cyclone affected people.

5.3.10 Instability of agricultural production

Agriculture is the main economic activity of the char-dwellers in the Jamuna river basin, regularly affected by floods. Crop production depends on the magnitude and timing of floods. Thus, the farmers of the area participated at the group dicussion (FGD session 4) adjust their annual crop calendar depending on the flood situation. Figure 5.7 illustrates the duration of major crops from sowing to harvesting in the char in a normal flooding year. The time of a common seasonal flooding is from June to September marked in blue in the table.

The farmers often sow Aush rice and deepwater Aman rice intermixed early in the pre-monsoon season (February to April). If Aush rice is damaged by early flood they can then still harvest Aman rice after flood. Aush rice is harvested before flood occurs (June) and deepwater Aman rice continues to grow with rising floodwater and eventually is harvested after floodwater has receded (October–November). Some farmers plant jute, *Kawn* (a kind of local millet) and sesame in the pre-monsoon season and harvest before flood occurs. Mustard, lentil and black gram are three early winter crops sown just after the time of flood recession. The farmers also plant Boro rice and wheat as a late winter crop (November–December) and harvest these crops in April.

However, in the case of early flood, Aush, sesame, Kawn and jute are damaged but Aman can sustain if floodwater increases gradually, such that farmers can eventually harvest 80–100 percent of their crop. Nevertheless, if Aman is also damaged due to sudden flood, farmers plant early winter crops such as mustard, lentil and black gram to minimise their losses. They sow both wheat and Boro rice. In case of late flood (July to October) the farmers can harvest Aush rice, Kawn, sesame and jute quite easily. But deepwater Aman rice is partially damaged due to the lack of required water. The farmers often cannot harvest transplanted Aman rice and even deepwater Aman rice. However, they select early-maturing varieties of Aman rice. Besides, they cannot sow early winter crops. But Boro rice and wheat are sown without difficulty and the production is satisfactory if other factors are constant.

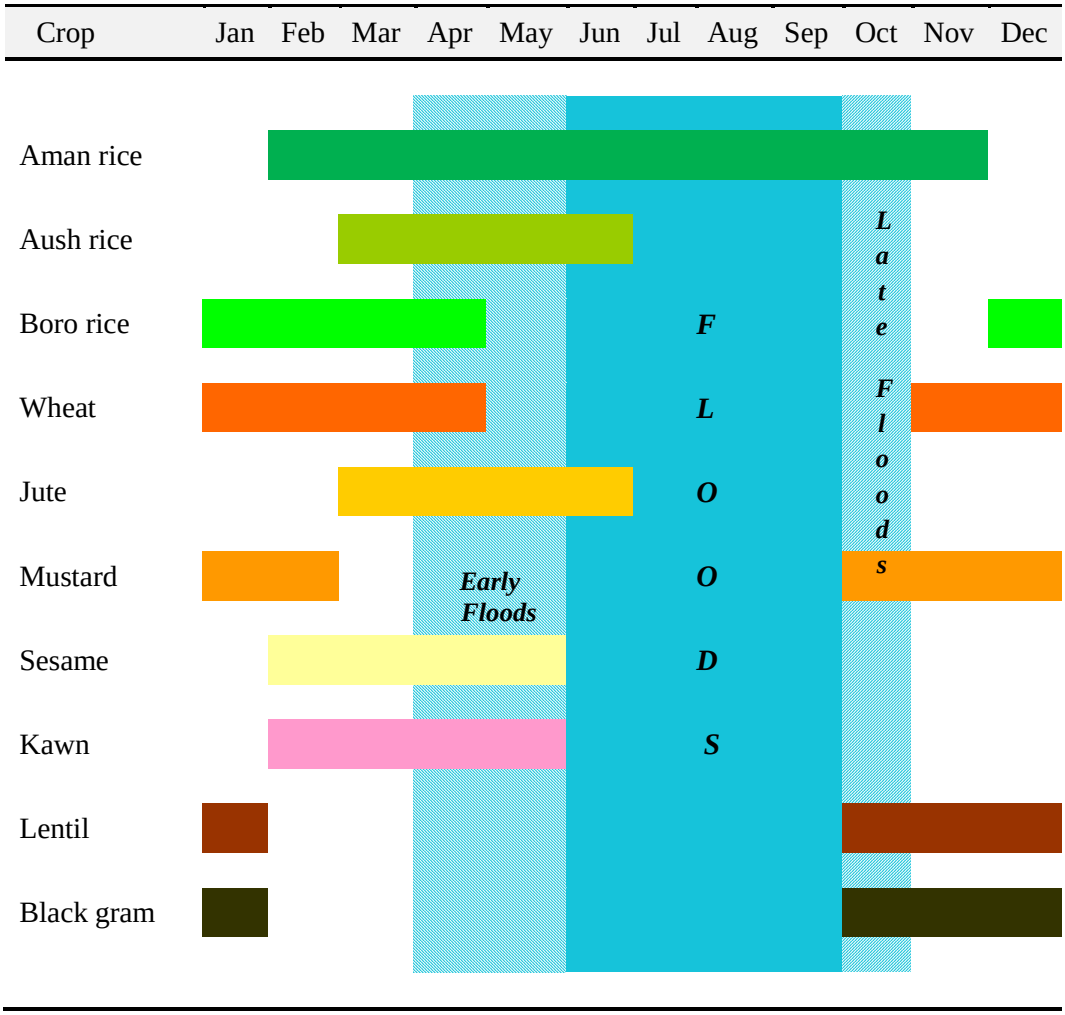


Figure 5.7 | Crop calendar of the char-dwellers at Bonna village for a normal flooding year

(Source: from FGD session 4, fieldwork at Bonna village, March–May 2012)

Finally, if it is a severe flood, the farmers experience miserable conditions. This is because all Kharif (pre-monsoon) crops are completely damaged. They cannot even sow early winter crops in time. However, they can sow both early and late winter crops after the floodwater has receded in October–November. After a severe flood, the national crop production dramatically decreases which accelerates a price hike. After a severe flood, farmers often experience a crisis of agricultural inputs such as seeds and fertilizer. The instability in rice prices and distribution of fertilizer is a critical political issue in Bangladesh (Raihan, 2013).

5.3.11 Instability of export goods and services

Like agricultural production, instability of exporting goods and services (e.g. associated with shrimp farming and the readymade garments sector) increase localised

vulnerability to natural disasters and climate change. Section 5.5.1 described how the relationship of globalisation and environmental disasters influence local people's livelihoods and can create vulnerability followed by forced migration from coastal areas of Bangladesh to major cities including Dhaka. However, globalisation and international trade not only create political vulnerability but also increase economic vulnerability to climate induced disasters. It was found from the FGD with the shrimp farmers and wage workers at Aila village in Satkhira district that instability of shrimp export puts them in an economic crisis due to their highly livelihood related dependency on shrimp farming and the minimum wage rate for their work. Shrimp farmers (evidenced by six out of eight respondents) loaned from money lenders at a high interest rate. The production of their farms decreased due to presence of highly saline water in their lands. Additionally, uncertainty in shrimp export places them in a more critical situation but they count on getting extra money to be able to pay back their loan. Therefore, five out of them had already leased their shrimp farms to a businessman who is an outsider but highly influential in shrimp farming, processing and exporting.

5.3.12 Generic and individual influences on vulnerability

Generic factors such as age, sex, religion and family type determine individual vulnerability to disasters. Evidence shows how women and children, especially in developing countries such as Bangladesh, were more vulnerable to disasters (Hossain et al., 1992; Begum, 1993; Ikeda, 1995) due to their poor participation in planning processes and activities of disaster preparedness and response (Khondker, 1996; Grossman and Owren, 2008). Ikeda (1995) argues that more women (71 per 1000) were killed compared to men (15 per 1000) during the cyclone of 1991 because many of them could not understand properly the early warning, and due to cultural constraints including their *Sharis* that restricted their mobility and because of their responsibilities at home for children and protecting properties. She adds that the lack of *Purdah* (privacy) in public shelters may also have deterred women from seeking refuge. In addition, public shelters and relief centres are generally less accessible to women than to men (Hossain et al., 1992; Ikeda, 1995).

Women have less accessibility to cyclone early warnings even in recent times whereas they are primarily responsible for domestic activities including preparedness for and

early response to cyclones. However, it is found from the next statement that women of female headed households can enjoy higher freedom and take their own decisions.

> "I did not hear the early warning before Sidr hit on our village. Men could hear about it because of their high mobility outside house. ... We, the women, are also responsible for looking after our children and the elderly family members in absence of our husbands. However, I am a widow; thus, I can take my own decision." (Interviewee 7: a widow aged 45, Sidr village, June–July 2012)

Likewise in coastal Bangladesh, the char-dwellers of Jamuna river basin distinguish between the flood vulnerability of men and women because of their distinctive livelihood strategies and division of labour. Men identify lack of work as the main problem due to floods scoring that at 10 out of 10 (Table 5.6). Unavailability of food and livestock fodder rearing are jointly ranked second (scored 9) followed by mobility problems and lack of sanitary latrines (scored 8). Housing problems are also recognised (scored 7) and rank fourth and lack of health facilities is fifth (scored 6). The male group scored 5 for lack of drinking water - ranked the lowest in the list.

Table 5.6 | Gender-specific flood vulnerability at Bonna village

Major flood impacts	Male		Female		Total	
	Score	Rank	Score	Rank	Score	Rank
Unavailability of food	9	2	10	1	19	1
Problem of cattle rearing	9	2	6	4	15	2
Scarcity of drinking water	5	6	8	2	13	3
Defecation problem	8	3	5	5	13	3
Communication problem	8	3	4	6	12	4
Lack of work	10	1	-	-	10	5
Lack of cloth	-	-	7	3	7	6
Homestead erosion	7	4	-	-	7	6
Problem of diseases	-	-	6	4	6	7
Lack of medical facility	6	5	-	-	6	7
Cooking problem	-	-	5	5	5	8
Showering problem	-	-	5	5	5	8

(Source: from FGD sessions 5 and 6, fieldwork at Bonna village, March–May 2012)

On the other hand, women rank lack of food (scored 10) as the main problem due to flood (Table 5.5). Lack of drinking water is identified as a vital issue by them (scored 8). Clothing is also identified as another major factor because of their personal privacy (scored 7). They cannot clean, dry and change their clothes when it is necessary. Problems related to livestock rearing and increasing diseases jointly ranked fourth (scored 6). Lack of sanitary latrine and showering problems are ranked fifth (scored 5) whereas mobility problem is selected as the least important problem in the table (scored 4).

Vulnerabilities vary between men and women according to their responsibilities and demands. For example, men rank work unavailability on top because they are responsible for earning money. On the other hand, women choose lack of food and drinking water because they are liable to manage and cook food, and further collect and preserve water for drinking and other purposes. Furthermore, though lack of a sanitary latrine is a common problem, men scored this at 8 compared to women who scored it as 5. Availability of dry clothing (scored 7), diseases (scored 6) and showering or bathing (scored 5) are also common problems of women during flood which are related to their personal hygiene and privacy. Alternatively, men score 8 against the mobility problem as they cannot move to their different destinations during flood. Though both men and women are affected by floods, in Bangladesh women are more vulnerable compared to men.

The women of the char-land suffer both inside and outside of the home. The dowry is taken by the husband but even after marriage some women are threatened for more money. Some women are being physically tortured by their husbands. Women also suffer outside the home in several ways. They receive lower wages than men. The daily wage rate is Tk. 300/- (£2.50) for men but Tk. 200-250/- (£1.66-2.08) for women though they have to do the same amount of work. However, both crimes are directly related to flood. Usually the char-dwellers consider getting dowry as a recovery strategy from flood losses. Thus, parents marry their male children during and after flood and get dowry from brides' parents. It is found from the FGD with women group that the rate of domestic violence is often increased during flood. The awareness of different emerging issues (e.g. female education, reproductive health, family planning, domestic violence) is, however, gradually being increased due to local NGO activities. It was observed that such awareness building programmes for

disaster preparedness are also applied for several CCA initiatives at local level through using the existing materials and human expertise for DRR.

Socioeconomic status is a vital aspect of vulnerability. The poor often have less access to disaster early warning systems and, therefore, they are least aware of an approaching hazard. Figure 5.8 shows how socioeconomic background determines awareness and effectiveness. All recipients belonging to a well off background tend to believe the early warning. It is highlighted in their awareness of cyclone preparedness and response. It was also observed that cyclone early warnings were disseminated in the areas where well off families usually live in.

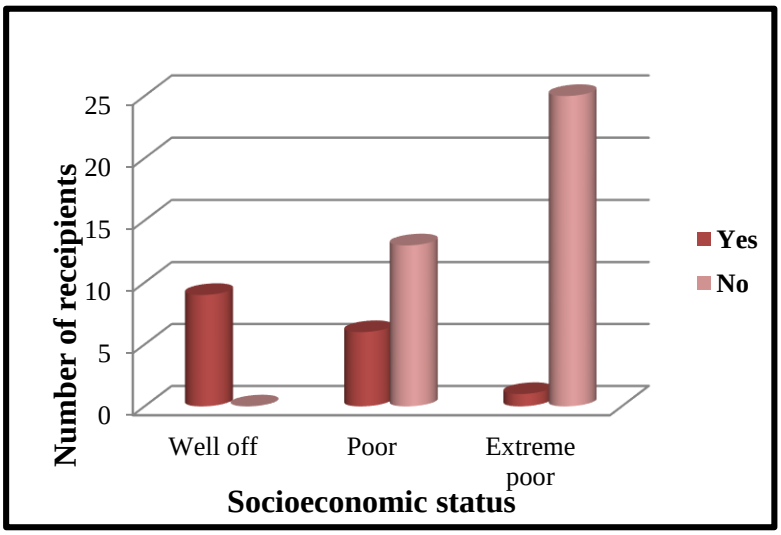


Figure 5.8 | Relationship between socioeconomic background and believing in early warning before cyclone Sidr

(Source: from questionnaire survey, fieldwork at Sidr village, June–July 2012)

On the other hand, less than a half of the recipients belonging to poor families (46.2%) believed the early warning, though one recipient belonged to an extreme poor background did the same. They claimed that they thought no cyclone would occur. They added that a number of false signals were declared leading to have them more reluctant in the actual event. Further early warning hardly disseminated in the remote southern part of Sidr village although cyclone Sidr landfell on that area. Thus, effective cyclone early warning as well as awareness programmes on cyclone preparedness and response can motivate the poor, particularly women and those with disadvantaged backgrounds.

5.3.13 Social inequality and collective vulnerability

Land tenure systems and inequality in land distribution are major factors of vulnerability to disasters in Bangladesh. The poor have less access to land due to their inaccessibility to local power structures. Land leasing and crop sharing systems often affect the poor and landless people negatively whilst the rich gain. It is observed that most of the agricultural lands of Bonna village in Sirajgonj district are very low and are regularly flooded. The respondents of the group discussions at Bonna village (FGD sessions 1, 2, 3 and 5) claimed that both landowners and sharecroppers are affected by floods. Usually landowners provide agricultural inputs (i.e. seeds, fertilizers, pesticides, wages and occasional other agricultural supplies). If crops are damaged by a severe flood, sharecroppers cannot harvest the yield and the landowners lose their investment. Further, if sharecroppers invest for this purpose, it is the worst condition for them as generally they have to loan money from moneylenders at high interest rates. Thus, sharecroppers are unable to recover losses even for the next few years. It was further observed that the process of getting loans from moneylenders is easier than the process of sanctioning a loan from an NGO or a bank. Furthermore, the residents have little access to agricultural facilities supported by the government. The situation for wage workers is that they are unemployed for the whole period of the flood, but then after the flood there are some job opportunities for them such as earth digging with different government programmes. Generally, the poor and extreme poor have little access to these jobs. However, those with close relationships to local leaders often can achieve such opportunities.

Most of the handloom sheds are closed during floods. Besides, heavy rains damage many handlooms and products as the structure of the sheds are not well-protected even though those sheds are situated on a high platform. Thus, the owners cannot fulfil their production targets. They usually receive an advance from buyers investing in raw materials such as thread, dye and wages. Moreover, they loan from local moneylenders, NGOs and commercial banks. During such climatic conditions, weavers generally lose their jobs.

Small businesspersons such as shopkeepers are also in trouble because of reduced char dwellers' purchasing capacity during flood period. Heavy rains damage the products in their shops due to lack of proper storage management. Wholesalers do not want to lend products to them.

5.4 Summary

This chapter focused on two areas which are interrelated and necessary to understand localised vulnerability in the context of environmental disaster and climate change. Firstly, it has shown specific to these communities in Bangladesh how they perceive existing natural hazards and future climatic risks, and how this is influenced by environmental, political, economic social and other factors. Secondly, the chapter has shown how these factors can increase their community vulnerability in a changing environment.

People's perception of disasters and climate change are dependent on the spatial distribution of natural hazards and the social construction of how they experience them in their life. The char-dwellers of Jamuna river basin define floods depending on their severity and their impacts on their life and livelihoods. Normal floods are absolutely accepted by local farmers. They adjust their annual crop and livelihood calendar according to the abnormality of the flood pattern. Severe floods are often costly and they seek external assistance to supplement their own coping capacity. Conversely, cyclone survivors described their perception of disaster risks through recent particular cyclonic events. Some other hazards such as river bank or coastal erosion are often underestimated although they are directly linked with root causes of vulnerability and expose the community to more prominent disastrous events as identified by the local stakeholders. The respondents of the study illustrated climate change impacts through their disaster related knowledge and experiences. They argued that future climatic risks would increase the frequency of severe disastrous events.

In this chapter, different dimensions of disaster vulnerability in changing environments were examined through understanding local people's perception of environmental disasters and climate change. These included environmental, political, economic and social dimensions at international, national and local level. This multi-dimensional vulnerability analysis assists in understanding the localised knowledge, experiences and practices of coping with climate change and disaster risks that is discussed throughout the next chapter.

Chapter Six

Local knowledge, experiences and practices: Community responses to disasters in a changing environment

CHAPTER SIX

Local knowledge, experiences and practices: Community responses to disasters in a changing environment

6.1 Introduction

Community responses to environmental disasters is an emerging issue both in disaster and climate change studies, particularly exploring DRR–CCA mainstreaming and integration at local level. Existing coping strategies to hazards during normal periods and in disasters, influenced by community vulnerabilities and resilience, may indicate how the concerned individual household or collective community will adapt to predicted future climate threats (IPCC, 2012). Scientific knowledge of future climate change and its predicted impacts on human and ecological systems is helpful but hardly feasible for effective adaptation at local level (IPCC, 2012; Lebel, 2012). Thus, the understanding of local level climate change impacts and community adaptation to these risks is a critical issue in recent climate change studies (IPCC, 2012), particularly in the developing world (Few, 2003). Knowledge related to the natural and social situations of a particular locality, is also needed (Hulme, 2008; Brace and Geoghegan, 2010; Ford et al., 2014). Local knowledge and experience can assist in enhancing adaptive capacity and community resilience (IPCC, 2012, 2014). It is therefore important to explore how local knowledge, experiences and practices can help communities in building a higher level of adaptive capacity to cope with environmental disasters in a changing environment.

This chapter attempts to answer the question: how are communities coping with environmental disasters in the context of climate change? The discussion of this question comprises three main objectives: (i) to examine local knowledge, experiences and practices associated with community coping mechanisms to hazards; (ii) to explore emergency responses to disasters, particularly as pursued by individual households; and (iii) to understand the potentialities and constraints of these coping mechanisms in their effectiveness in reducing the risks of present climate variability and future climate change.

6.2 Local knowledge, expereinces and practices: Conceptual construction of coping mechanisms in environmental disasters

Local knowledge is valued as important information for understanding the relationship between vulnerability and coping (Pelling, 1999; Adger, 2000; Few, 2003), and in assisting in disaster preparedness (McAdoo et al., 2009; Shaw et al., 2009). Few (2003) argues that most empirical studies primarily explore the variation in exposure to natural hazards and people's coping strategies for these hazards. Wisner et al. (2004: 113) argue that "coping (or adaptation) is the manner in which people act within the limits of existing resources and range of expectations to achieve various ends." Nishat et al. (2000) argue that this coping process may continue over time. Cardona (1999) critically analyses different types of coping and adaptive strategies in terms of their social, economic, technological, institutional and cultural mechanisms.

Poverty is an important constraint for coping strategies and the extreme poor and disadvantaged people are often exposed earlier to disaster risks and suffer more compared to the other social groups. However, individual households and the collective community utilise their knowledge and resources to cope with disaster risks. These coping strategies are a mixture of both proactive and reactive measures by individual households and the collective community. Proactive measures, including natural resource-based preventive technical measures, particularly in agricultural production and livelihood diversification, assist households and communities living with natural hazards to prepare themselves to cope with potential future disasters. Relief-based reactive measures help them to recover from disaster losses and damage. However, different characteristics of hazards and their associated disasters, on the one hand, and social construction of disaster affected areas, on the other hand, determine how an individual or a community copes with the situation. There are distinct differences between coping strategies of survivors of slow onset (e.g. droughts and floods) and rapid onset (e.g. earthquakes and tropical cyclones) disasters.

Considering the aim of the thesis and the research questions within this chapter, it is important to understand how the people of the study areas cope with these environmental disasters by using their inherited knowledge and practices. The next sections highlight how disaster survivors live in high risk areas and cope with recent events so as to aid the understanding of their adaptive capacity to climate change.

6.3 Living with floods: Community responses

Regular floodwater covers one-fifth of the total land of Bangladesh every year (Chowdhury, 2000; Mirza et al., 2001), although, in extreme cases, it may inundate up to 70 percent of the country (Mirza, 2002). A normal flood is commonly considered as a blessing for agricultural production by local people (Brammer, 1990; Blaikie et al., 1994; Smith, 1996; Wisner et al., 2004). As floods are unavoidable phenomena and some of them have devastating impacts on socio-ecological systems (Paul, 1984, 1997; Rasid, 1993; Few, 2003; Wisner et al., 2004), flood-affected communities adopt several measures and strategies to minimise the disaster losses and damage (Brammer, 1990). Local people in flood prone areas appear to survive during and after severe floods by utilising their inherited knowledge and experience. This section critically analyses this issue in more detail referring to the empirical data collected at Bonna village. The participants generally gave their opinions based on their previous experiences, particularly of the flood of 2007.

The char-dwellers of Bonna village (FGD sessions 5 and 6) mentioned that floods are part of their daily life and they have several coping strategies and measures based on their traditional knowledge and experiences. However, there were some differences between the coping strategies of men and women. It is understood from the field data that male-specific coping strategies are primarily associated with their livelihoods such as cropping pattern, livelihood diversification and seasonal migration. Conversely, female-specific coping strategies are often in-house activities during flood periods. However, both groups have many common strategies to cope with floods, such as for example selling their labour in advance.

6.3.1 Cropping pattern

The respondents engaged in agriculture explained how they changed their cropping patterns to cope with the flood of 2007 to continue securing their livelihoods. Figure 5.9 in the previous chapter shows the duration of major crops from sowing to harvesting in the char in 2007. Though regular seasonal floods occur and remain between the months of June and September, severe floods came one month later in 2007 but remained until September.

The farmers of char-lands in Bangladesh developed a flexible but sustainable crop calendar by utilising their inherited knowledge and practices after considering local

climatic condition and the nature of potential hazards (Section 5.3.10). These knowledge and practices may assist them in adapting to future climate risks. This and more will need to be well understood for mainstreaming an integrated DRR-CCA approach at local level. The livelihoods of the char-dwellers are diversified and complex, particularly in a year when a severe flood occurs.

6.3.2 Livelihood diversification

The livelihoods of the char-dwellers of the major river basins in Bangladesh are diversified including both on-farm and off-farm activities, and many of them have a main and a secondary occupation (Carrey, 1985; FAP16/19, 1993). The present study identified a similar pattern of findings related to local livelihoods that the char-dwellers of Bonna village are involved in, with diverse occupations to survive because of the uncertainty of their primary livelihoods. Though they have one main occupation, they also carry out temporary and seasonal works. For example, the farmers and agricultural workers are mainly involved in two seasons in a year; the major portion is from February to June and the comparatively minor portion is during October and November (Figure 6.1). In 2007, they were involved in transplanting Aman and sowing Aush rice in February-March and harvesting Aush rice in June-July. However, many of them lost their jobs overharvesting Aman rice as floodwater came quite late in July.

The earth-diggers mainly work in and around Bonna village under different projects run by the government and NGOs. The job is mainly available between the months of October and May. A major portion of agricultural workers move to earth-digging especially in the months of December and January. The most significant feature is that almost half of the earth-diggers are female. It was found from the group discussion with both male and female groups that after the 2007 flood, the local Union Parishad (UP) and Chars Livelihoods Programme (CLP), a DFID funded programme, conducted some post-flood reconstruction works such as road and market place maintenance through a ‘cash for work’ programme. A large number of men and women were involved in the work, though a few argued that the project managers were biased to elites and they select people by taking bribes.

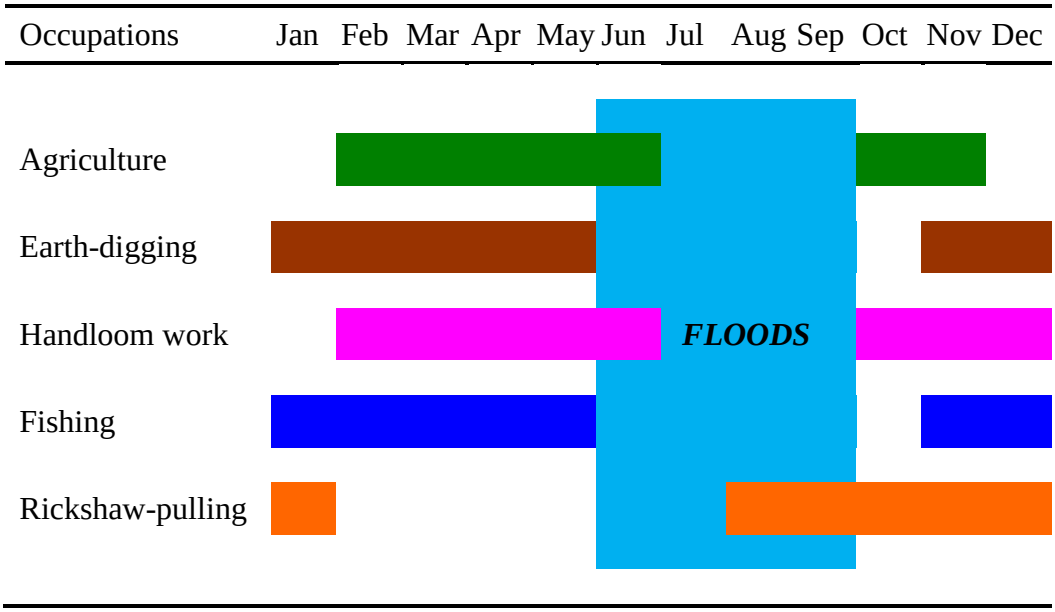


Figure 6.1 | Seasonal calendar of different occupations at Bonna village

(Source: from FGD session 3, fieldwork at Bonna village, March–May 2012)

A significant number of char-dwellers of Bonna village work as weavers in handlooms in and around the char. This occupation was available throughout the year except the months of July to September in 2007 as handloom sheds were under floodwater and some others were closed due to heavy rain. In addition, some handloom workers claimed that they worked in agricultural fields as their alternative occupation after the flood had gone.

Furthermore, some fishermen live in this char usually catching fish in the open water of the Jamuna River from November to May. They hardly shift to other occupations as most of them have no additional skills that would apply to doing other jobs. A previous study claimed that the number of fishermen in the char-lands of Padma and Meghna River was gradually decreasing (Carrey, 1985). Though the number of fishermen has been unchanged for last 10-12 years, it was seen to be likely from this fieldwork that they will shift their livelihood in the near future as fish production from the river continues to decline. The fishermen also claimed that they faced problems catching fish as some local elites of the area controlled major portions of the river. However, some of the fishermen group were involved in crop fields as wage workers after flood periods.

It was found from the group discussion (FGD session 3) that around 50-60 percent of males migrate temporarily to Dhaka, Chittagong and other urban areas for rickshaw-pulling and assisting in construction sites due to the lack of work in Bonna village between the months of August and January. Most agricultural workers also migrate for paddy harvesting in different districts and a few go to work in brick fields. "Food for work" is a vital livelihood option for the women of the poor and the extreme poor families including the widow headed families. Some of them may get half a kilogram of rice to bring to their homes. However, a very few get a cash lump sum. In 2007, many women worked for their well-off neighbours during the flood. Nevertheless, some of them worked in 'cash for work' projects implemented by the local UP and CLP. Table 6.1 describes the diversification of livelihoods of the char-dwellers at Bonna village.

Table 6.1 | Livelihood diversification of the char-dwellers at Bonna village

Classes	Primary livelihood	Secondary livelihood	Tertiary livelihood
Well-off and middle class (male)	Farming Handloom owner Business	Agricultural land leasing and/or sharecropping	
Poor and extreme poor (male)	Sharecropping Wage work in handlooms	Agricultural wage work	
	Fishing	Wage work in handlooms	
	Agricultural wage work	Earth digging	Rickshaw-pulling (migration) Wage work in construction & brick fields (migration) Paddy harvesting (migration)
Poor and extreme poor (female)	Domestic work (permanent) Earth digging	Post harvest work (seasonal)	

(Source: from FGD session 3, fieldwork at Bonna village, March–May 2012)

6.3.3 Seasonal migration

Men from rural Bangladesh often migrate to urban areas, particularly Dhaka city to find a job for a few weeks during lean periods (Shamsuddoha et al., 2012). The present study also found that seasonal migration is an important and ultimate adaptation strategy of the char-dwellers. Usually the men migrate to different places throughout the year to find work. Table 6.2 shows where and for what they moved after the flood in 2007. Wage workers migrated temporarily outside of the char over the next few months after the flood especially from November 2007 to April 2008. Karotia, a local business centre in Tangail district, was the main destination of migrants for harvesting rice. Manikgonj and Faridpur, two districts in the central part of the country, were the next popular destinations (for harvesting jute). Furthermore, many migrants went to Sylhet division in March-April 2008 for harvesting Boro rice. A few migrants went to greater Rajshahi region during the flood (August-September 2007) for harvesting Aush and Aman rice.

Table 6.2 | Places, causes and duration of seasonal migration by the char-dwellers at Bonna village

Places	Distance (km)	Causes	Duration	Number of people
Tangail	35	Paddy harvesting (Aman rice)	15–30 days	15–20
		Wage work in handlooms	1–4 weeks	25–30
Manikgonj	45	Crop harvesting (e.g. jute, maize and chillies)	10–15 days	15–20
Faridpur	100	Jute harvesting	10–15 days	20–30
Rajshahi	200	Paddy harvesting (Aush rice)	2–4 weeks	20–30
Sylhet	320	Paddy harvesting (Boro rice)	30 days	20–30
Dhaka	110	Rickshaw-pulling	1–2 months	5–10
		Wage work in brick-fields and construction sides		5–10
Chittagong	350	Rickshaw-pulling	1–3 months	2–3

(Source: from FGD session 3, fieldwork at Bonna village, March–May 2012)

Dhaka and Chittagong are the two major destinations of the migratory char-dwellers for rickshaw-pulling, working in brick-fields and construction sites. In addition, some go to Tangail town for weaving. But during a normal flood year the overall migration

rate is less compared to that of the years of severe floods. It was found that a large number of the char-dwellers (mostly men) migrated to different places after the 2007 flood. Dhaka and Chittagong were the main two destinations for them. Nonetheless, a smaller number of women migrated to Dhaka for jobs at garment factories after the flood.

Seasonal migration is a vital livelihood strategy of the char-dwellers that generates regular remittances from outside their villages especially in severe flood years. Migration for harvesting crops (e.g. rice, jute) is a common practice even in normal flood years. When the availability of local agricultural work decreases due to increased floodwater in their char-lands, the wage workers migrate to the mainland for harvesting crops. In a severe flood year, the farmers cannot harvest their standing crops due to sudden increases of flood water and they plant winter crops if the flood prolongs. This is often the cause of a shortage of livelihood opportunities for the wage workers and increases unplanned migration to urban areas for informal economic activities such as rickshaw-pulling and working in brick fields and construction sites. There are many other household level coping strategies, particularly during and after severe floods; and some of them are gender-specific as discussed in the following sections.

6.3.4 Household level gender specific coping strategies during and after floods

In a similar way in which there are community level coping strategies associated with vulnerability and exposure to disasters (for examples, floods and river bank erosions), there are many household level coping strategies (Schmuck-Widmann, 1996; Rasid, 2000; Brouwer et al., 2013). These are often gender specific (Nasreen, 2012). It was found from the field study that there are differences between the coping strategies of household men and women in how they cope with environmental disasters.

Table 6.3 illustrates the various coping strategies associated with different types of vulnerability of men during flood. As the environment and life of the char-land is full of uncertainties, such as with other char-lands of Bangladesh, the char-dwellers are often involved in different types of occupation as highlighted above. Men migrate temporarily or seasonally to different places including Dhaka because of unavailability of work. They are underpaid for the work they do. Further, men often

sell their labour in advance to well-off or large farmers[8]. Moreover, men get loans from different sources (see chapter 7 for detail).

Table 6.3 | Coping strategies of men to floods at Bonna village

Vulnerabilities	Coping strategies
Lack of work	• Livelihood diversification • Cropping pattern • Migration • Low wage • Selling their labour in advance • Loan
Lack of food	• Low food intake (both quality and quantity)
Livestock rearing	• Selling cattle • Bring cattle to embankment • Lease cattle to people who live in mainland
Mobility	• Nominal mobility • Request someone else to do something
Lack of sanitation	• Defecate on boat
Housing	• Raising homestead plinth • Planting grass surrounding plinth • Raising bed and table • Shelter on roof • Move to embankment or flood shelter
Lack of health facilities	• Do not go to doctor or health centre
Lack of drinking water	• Drink open water • Use water-cleaning tablets

(Source: from FGD session 5, fieldwork at Bonna village, March–May 2012)

Mobility during flood periods is a severe challenge for the char-dwellers, particularly for men. Sometimes they follow a strategy to send one person outside the char, mostly to the mainland market places and towns to buy their essential goods.

Men consume lower amounts of food alongside women during flood because sufficient food is not available in their home. Though livestock is a valuable asset for

[8] It was found from the fieldwork that the extreme poor of Bonna village often loan from their well-off neighbours during flood. For this they are committed to work in the rich persons' lands in the following pre-monsoon season. Indeed, the poor are often underpaid. However, this strategy helps them to cope with severe floods.

the char-dwellers, they have to sell cattle due to a lack of fodder. Men also bring cattle to the nearest mainland embankment. They lease their cattle to the people who live on the mainland. But, in the case of goats and poultry, they sell them immediately. It is difficult to manage them during flood and very often they are either stolen or affected by diseases or die from snake bites.

Hygiene and sanitation are also a problem for men. They have to defecate in open water sitting on boats because usually their hanging toilets are washed out. Further, they drink open floodwater because most of tube wells go under water. They use water-cleaning tablets if they can get them from any government department or NGO. However, often men, especially the elderly, are affected by different diseases during flood periods. However, they do not go to a doctor or health centre so as to not spend any money for this purpose.

The char-dwellers face a great problem of access to shelter during floods. They say that usually the homestead plinth is comparatively higher than other infrastructures in the char and they can survive in a moderate flood that way. But in the case of a severe flood like that of 1998, they are at risk. They claim all houses of their char were damaged during 1998 flood. They raise their beds and tables when floodwater gradually increases. Sometimes they have to take shelter on the roof when their houses totally go under water. They try their best to stay at home to preserve their assets. Finally, they have to move to the embankment or flood shelter. In recent years, CLP has raised the plinth of the houses of the poor and the extreme poor so that their houses did not go under water in the flood of 2007 and now they believe they will not face such problems again as they did in 1988 and 1998.

Table 6.4 illustrates the various coping strategies associated with different types of vulnerability of women during flood which are mainly at the household level. The women participated at the group discussion (FGD session 6) mentioned that food crisis as the main influence of vulnerability on women who institute some strategies to adapt to this. They engage a low amount and quality of food intake, fast and generally use a lowering of nutrional quality of life to adapt to flood. They survive through preserving *Muri* (puffed rice) and *Chira* (flattened rice) before the main flood risk time.

Table 6.4 | Coping strategies of women to floods at Bonna village

Vulnerabilities	Coping strategies
Lack of food	• Low food intake • Fasting • Intake low quality food • Sow vegetables on roof • Collect leafy vegetables from roadside & open water
Lack of drinking water	• Drink open water • Use water-cleaning tablet
Lack of cloth	• Do not shower everyday • Try to dry cloth i.e. Shari
Livestock rearing	• Raising cattle shed • Selling poultry
Diseases	• Do not go to doctor or health centre
Lack of sanitation	• Defecate on boat • Move in a group
Cooking problem	• Use mobile mud-made stove • Cook once a day • Keep fuel for crisis period
Bathing problem	• Do not bath everyday • Bathe in open water

(Source: from FGD session 6, fieldwork at Bonna village, March–May 2012)

Women cook once a day during flood because their permanent mud-made stoves are damaged by floodwater and because of the fuel crisis. They claimed that usually there is a mobile mud-made stove in each house because it can be moved easily and kept on a high platform or table. Women often keep some fuel, such as firewood and dry leaves, hanging from the roof before flood occurs. The char-dwellers, especially women, plant grass and vegetables in the plinth surrounded their house to protect them from wave and erosion during a flood.

Women are mainly responsible for collecting and preserving drinking water year-round. But during flood they are solely responsible for this task because they do not send their children long distances to collect drinking water as they would do at normal times. Sometimes they have to move long distances by boat searching for a tube well which is not under the floodwater. However, in general, they collect open floodwater.

Women claimed that they follow a strategy to collect fresh water. At first, they try to identify a place where floodwater is comparatively less muddy. Then they push the water to both sides continuously with both hands and then better clean water is available and they collect it into their mud-made or steel-made jars. They also use alum or water purified tablets into drinking water. However, they use open floodwater for other purposes.

Women often face problems in maintaining their privacy in relation to their clothing, showering and defecation. In general, women of the poor and extreme poor families have a single Shari or at best two. Thus, if it is a rainy day during flood they cannot shower as the Shari takes time to dry. They cannot have a shower everyday during flood. Besides, they have to bathe in open floodwater as their shower room is washed out by floodwater. Further, women have defecation problems during flood. Like others they have to defecate in open water sitting on a boat. Usually they move in a group at this time and search for a jungle or remote place for defecation. Nevertheless, they face more problems at night due to privacy and security concerns.

Table 6.3 and 6.4 indicate that the adaptation strategies of men are generally closer to their occupations than women, whose adaptations are affected by their family and assets. Women are primarily responsible for tackling the in-house crises, especially during severe floods, compared to their male counterparts who are often involved in the livelihood-related off-house coping strategies. Apart from some initiatives by the government and NGOs in awareness building for women's empowerment, the still voices of women are rarely considered in local level planning, particularly in disaster management planning. It was observed during the fieldwork that local NGOs encourage women to participate in the planning and implementation process of NGO programmes and projects. Implementation of an integrated DRR-CCA approach at local level demands inclusion of the community in the planning and implementation process, and the success partially depends on how gender-specific community-based coping strategies are understood and considered. Nonetheless, the char-dwellers have some specific coping mechanisms associated with external interventions, particularly post-disaster activities including relief work.

6.3.5 Coping through relief and rehabilitation programmes

Humanitarian assistance through relief work can be a conventional aspect of disaster response. This is generally the first step taken by external actors for disaster survivors. Relief work is primarily administered by "command and control" approaches and often administered with a military presence (Wisner et al., 2004). Such militarised relief activities generally work on the basis on spatial needs and there is a tendency to operate without considering socioeconomic dimensions. Meanwhile, local social structures and political institutions influence relief activities. It was observed from the field study that socio-political influences extend over a long period, particularly in rehabilitation and reconstruction phases. Therefore, local level disaster survivors cope with post-disaster external activities through utilising their personal relationships with local elites. Chapter 7 discusses this issue in more detail. Likewise flood, cyclone survivors of the country have their distinct coping strategies that are reported in the following section.

6.4 Response to Sidr and Aila: Community strategies

Nichols et al. (1995) reported that 42 percent of the total global deaths associated with tropical cyclones have occurred in Bangladesh over the last two centuries. Nonetheless, death tolls from cyclones in the country have been gradually decreasing since 1970 (minimum 300,000 people died) to 2007 (3,406 deaths) (DDM, 2013b). Many studies claim that improved preparedness and response measures including early warning and evacuation systems, cyclone shelters, coastal embankments and reforestation programmes as major factors (Shamsuddoha and Chowdhury, 2007; Blacke, 2008; Hossain et al., 2008; Rogers and Tsirkunov, 2010; World Bank, 2010; Haque et al., 2012). However, Paul (2009) argues that the physical characteristics of Sidr such as its duration of storm and storm surge, and landfall time and site also reduced the death toll. They, however, agree that cyclone Sidr was costly in terms of economic losses. In addition, Mallick et al. (2011) claim that cyclone Aila also damaged physical infrastructure and so obstructed post disaster activities. Ikeda (1995) argues that more women (71 per 1000) were killed compared to men (15 per 1000) during the cyclone in 1991 because many of them could not understand properly the early warning and cultural constraints including their Sharis restricting their mobility and their responsibilities at home for children and protecting properties.

As with the char-dwellers of Jamuna river basin, the coastal people including the char-dwellers of the coastal char-lands in Bangladesh have also their coping strategies at individual household and collective community levels. The previous section of this chapter largely focused on how the char-dwellers of Jamuna river basin cope with floods in terms of their day-to-day life including through gender-specific pre-, during and post-flood coping strategies and measures. Avoiding repetition this section discusses how the coastal people cope with a specific extreme event, and aid to enhance their adaptive capacity for the next event. The description and analysis of this present section of the thesis is based on field data (both quantitative and qualitative data) collected from the cyclone survivors at Sidr village. The respondents primarily shared their experience of cyclone Sidr and Aila and their coping strategies in both cases. The strategies they reported included how they prepare for those extreme events and responded to early warnings and post-disaster activities.

6.4.1 Response to cyclone early warning: Receiving and believing

It is well-established that CPP activities such as the dissemination of early warning systems at community level and the establishment of cyclone shelters along the coast have assisted decreasing death toll since 1970. However, Paul (2009) argues that a sizable number of Sidr survivors did not receive any early warning which challenges the success of CPP activities. The complete achievement of cyclone early warning depends not only on dissemination process but also on whether recipients believe it and how they act on it. The present tendency of response to early warning will assist potential cyclone victims in future devastating events. The study explores whether the respondents of Sidr village in Barguna district (50 respondents in total) responded to early warning before cyclone Sidr and Aila hit their village.

Figure 6.2 shows slightly less than two-fifth of the respondents (38%) did not get any early warning before the Sidr hit their area. However, the majority of the respondents of northern Sidr village received early warning. That part of the village is well-connected with Patharghata town; thus some commuters got the hint of a cyclone was approaching towards their locality. There is an NGO office-cum-cyclone shelter and the NGO staff informed the micro-credit recipients of the upcoming cyclonic event and convinced them to move to the shelter. Conversely, in the case of the southern part of the village, the respondents claimed that the local CPP volunteers and NGO staff did not disseminate early warning properly especially in their locality. However,

this allegation was refused by the local CPP volunteers and NGO staff. The reality is that more than a half of the respondents of southern Sidr village did not receive any early warning before Sidr hit their area.

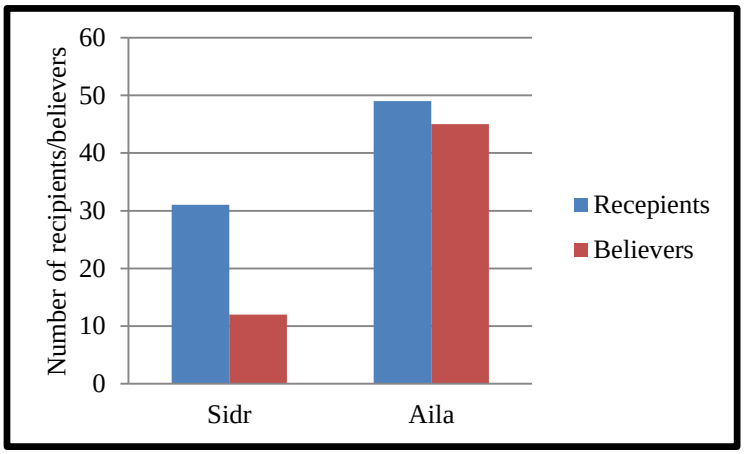


Figure 6.2 | Receiving and believing cyclone early warning before cyclones Sidr and Aila

(Source: from questionnaire survey, fieldwork at Sidr village, June–July 2012)

Roughly two-third of the recipients of early warning (61.3%) did not believe the information given that a cyclone like Sidr would hit their village. Most believers in the early warning message lived in the southern part of the village as they had observed quick changes in nature before the cyclone hit their area. More than half of the respondents who did not believe the early warning claimed that such type of early warning message was often declared and that is why they did not take it seriously in the time of Sidr. Besides, around one-third of them argued that a false signal was declared a few days before the actual event occurred. One-third of the respondents who did not believe the early warning disagreed with the claim of CPP volunteers that EWS was functioned properly before Sidr. Furthermore, some Sidr survivors did not realise the high probability of Sidr impacts on their locality.

All respondents except one received an early warning before Aila hit their village, and all recipients except four believed the early warnings. It is clear from the present study that both the number of recipients and believers of early warning dramatically increased within two years. This was mainly due to the CPP volunteers who worked in a hard and systematic way to cover the whole community before Aila. Thus, Sidr was

a test for them as to how they could disseminate early warning properly but quickly to a community in emergency. The recipients of early warning also accepted it and quickly disseminated the warning to others. The reason given by the four respondents as to why they did not believe the early warnings for the case of Aila was not observed strongly in Patharghata but appeared to be because of its distance from the area where cyclone Aila primarily hit, being on the coast of the international boundary between Bangladesh and India.

6.4.2 Cyclone preparedness

Preparedness is a vital responsibility of potential disaster victims which may help to reduce disaster related losses and damage and lower the burden of recovering from those losses (Wisner et al., 2004; IPCC, 2012). However, social vulnerability in terms of gender, age and other social groups and factors influence how an individual or a community prepare for DRR and CCA.

When the respondents were asked what they did first when they had heard or realised about the cyclone Sidr, around half of them said that they did nothing (Table 6.5). Extensive studies on the reasons why people relax to take preventive measures before cyclonic events have been carried out in Bangladesh and India (Bern et al., 1993; Chowdhury et al., 1993; Dash, 2002; Thomalla and Schmuck, 2004). Apart from the institutional failure in public awareness of cyclone preparedness and disseminating early warning, the people also behave differently when faced with an unusual event, mostly due to lack of direct experience of an extreme event in the recent past (ibid.). It improved within two years when the majority of the respondents (90%) took preventive measures. These measures include storing dry food, cloth and valuable belongings in a safe place and looking for relatives and neighbours.

Table 6.5 | Comparison between the activities first done by the respondents before Sidr and Aila

Activities	Sidr	Aila
Planning	2	27
Storing food and cloth	12	29
Keeping children with them	11	16
Talking with husband	2	6
Looking for relatives and neighbours	2	11
Hiding ornaments	1	6
Moving to shelter, relative or neighbour's house	10	13
Having a meal	4	0
Did nothing	24	5

Note: Total number of the respondents is 50 and some of them chose more than one option.

(Source: from questionnaire survey, fieldwork at Sidr village, June–July 2012)

The majority of the people took an action plan before the landfall of Aila that they did not do in the case of Sidr (from 4% to 56%). As with the char-dwellers of Bonna village, the coastal people also stored essential goods such as paddy, rice, dry food and cloth. The women stored paddy or rice in big pots and then tied them properly before putting them on a high platform so that they would not be damaged. Their husbands and children also helped them to store paddy or rice as it is their main staple food. It is often found that people in rural Bangladesh consider paddy or rice as their major asset for surviving. So, a family without cash but with paddy or rice for the next one year or even for few months is ususlly considered a 'well-off' family in the context of surviving in hardship. Few women (5%) also hid valuable belongings such as ornaments, personal and family photos, religious books and the photos of Hindu deities. Ornaments are considered a belonging to sell for surviving whereas the photos are important for them either as a piece of memoriabilia or as a religious asset. Livestock is another valuable asset for the people. In both cases, the people released their cattle into open fields except three women who brought their cows to the cyclone sheter during Sidr. It was observed that the cyclone shelter had no provision of shelterng livestock.

Four respondents claimed that they had their meals first as some food remained after their supper on the same night and they did not want to waste it. They consumed them as they were not sure where they would go and whether they could bring the food. This is a snapshot of the hardships of the local people from the Bangladesh coast rather than a common sight of their daily life. The poor do not want to waste their food even in an unusual situation.

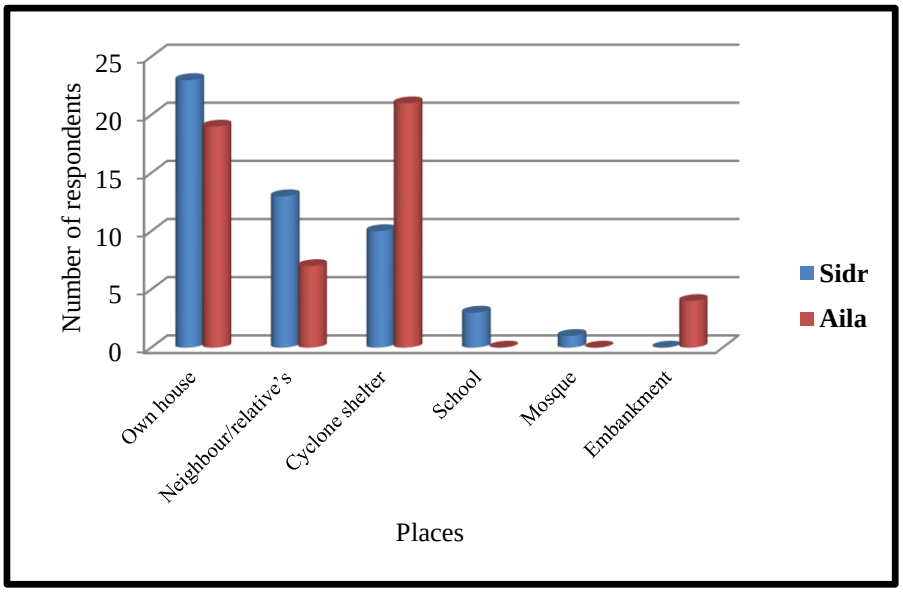
Table 6.5 shows that the tendency of looking up relatives and neighbours has been increased during Aila. Since Sidr, the NGO staffs have been motivated and the local people moved forward collectively in reducing disaster risks. The respondents also claimed that they were concerned about the potential impacts of future climatic events such as Sidr and indeed they helped each other during Aila. Previous studies already showed why and how social capital assists communities to cope with disasters and can enhance their adaptive capacity to climate change (Coleman, 1988; Adger, 2001, 2003; Nakagawa and Shaw, 2004; Dynes, 2005; Goulden, 2006; Cutter et al., 2008; Doerfel et al., 2010; Hawkins and Maurer, 2010).

There is no significant change in sheltering under safe places including cyclone shelters (from 46% to 56%). The next section looks at why a large number of the people stayed in their own (unsafe) houses instead of moving to cyclone shelters or other safe buildings. The policy-makers and the professionals need to focus intensively on the issue of how they can build public awareness of cyclone preparedness, and motivate communities responding to early warning and move to cyclone shelters.

6.4.3 Sheltering during cyclones

The Government of Bangladesh started to build cyclone shelters in 1972 along the coast for evacuating the vulnerable people from their unsafe houses, although a significant number of people do not respond to the evacuation orders (Bern et al., 1993; Chowdhury et al., 1993; Paul and Dutt, 2010). Figure 6.3 shows that a sizable number of the respondents of Sidr village refused to evacuate to cyclone shelters and stayed in their own houses during cyclone Sidr and Aila (46% and 38% respectively). The chapter has already analysed how the failure of EWS at community level, and the behaviour and attitude of the early warning recipients can discourage a community to trust warnings, and can likewise detract from evacuations to cyclone shelters. Around

three-quarter of the respondents who stayed in their own houses did not expect a cyclone like Sidr would occur, and they decided to stay in their own homes even though most of them received early warnings. Many women stayed in their own houses to protect their assets, particularly livestock indicating the strong relationship between cattle ownership and acceptance of evacuation orders (Paul and Dutt, 2010). Others claimed that they had to stay in their unsafe houses due to long distances to the nearest cyclone shelter. Previous studies show that not only inappropriate locations of cyclone shelters but also other characteristics such as accessibility to shelters, safety requirements and living conditions discourage people, particularly women, senior citizens and persons with disabilities to move to shelters (Talukder et al., 1992; Paul and Dutt, 2010).



Note: Total number of the respondents is 50.

Figure 6.3 | Locations where the respondents of sidr village reported they sheltered during Sidr and Aila

(Source: from questionnaire survey, field survey at Sidr village, June–July 2012)

In the case of moving to the cyclone shelter at Sidr village, the evacuation rate more than doubled during cyclone Aila (from 20% to 42%). Although the characteristics of the cyclone shelter were unchanged, EWS operated more effectively at the community level and the people were proactive in taking preventive measures including moving to the cyclone shelter. However, in both cases, a sizable number of the respondents,

particularly the women, sought shelter in their relatives or neighbour's houses as they wanted to stay in a group.

It was noted that the majority of the extreme poor from the southern part of Sidr village refused to move to the cyclone shelter and stayed in their poorly constructed houses, although they were exposed first to both cyclonic events. Conversely, the majority of the well-off people from the northern part of the village either stayed in their well-constructed buildings, moved to the cyclone shelters and were comparatively least affected in both cases. Previous studies argued that the poor who live in high risk areas are often more exposed to disasters and are more vulnerable in terms of disaster losses and damage (Blaikie et al., 1994; Wisner et al., 2004; IPCC, 2012, 2014).

6.4.4 Post-disaster responses

The people of Sidr village were involved in several post-disaster responsive activities including searching for lost items including livestock and ornaments; looking up relatives and neighbours; assessing losses and damage; and repairing damaged assets including their houses. Women prepared new earth stoves first for cooking as their old ones were damaged. The well-off households did more loss and damage assessment compared to the poor and extreme poor. Loss and damage assessment included both household-based assets and agricultural production. The majority of the people of extremely poor households requested emergency relief rather than assess what they had lost. These respondents that belonged to poor and extreme poor backgrounds and who did not assess their lost property, indicated there had been nothing left for them to assess. In addition, respondents agreed that the degree of disaster losses and damage would be minimal if they took preventive measures to protect them. However, some of the cyclone survivors argued that they could not minimise the losses and damage, and indeed they surrendered themselves to the act of God.

In terms of repairing damaged assets, a greater proportion of the well-off families (66%) repaired their damaged properties compared to the poor and extreme poor (31%). The respondents mainly repaired their damaged rooves, walls and plinths of their houses. It was observed during the fieldwork that there is a strong relationship between social class and usage of repair materials. Corrugated roofing sheets and wood logs were used for repairing the well-off houses whereas bamboo, straw and

mud were commonly used materials amongst the poor and extreme poor. In addition, the well-off families hired people, particularly their poor relatives and neighbours for repairing their damaged houses whereas the men of the poor and extreme poor families repaired or rebuilt their own houses helping each other. In some cases, their wives and children also assisted them. A large number of the respondents (40%) claimed that they had no money to repair their damaged properties. Nonetheless, a few of the respondents, particularly those belonging to the extremely poor households did not rebuild their houses, rather they expected external assistance to rebuild their fully damaged houses; they temporarily moved on to the embankment of the River Boleswer.

It is evident from the above discussion that coping with tropical cyclones is distinct from coping with floods. Data from the fieldwork shows a substantial proportion of the respondents did not respond to Sidr but did so two years later in the case of Aila. They claimed that they were self-motivated and self-guided as they experienced Sidr just two years earlier and therefore did not wait for verifying the likely accuracy of any early warning. It is an example of how the survivors of previous disasters utilise their experiences the next time around, which also help to motivate them to adapt to climate change and reduce the extra burden of external actors implementing DRR-CCA at the local level.

6.5 Adapting to shrimp farming and coping with climate change: A Third World political ecology perspective

Although political ecology offers powerful analytical tools to understand more holistically the social and environmental problems, as an academic discipline it can be "divided and ambivalent in its attitude towards and engagement with environmental and social policy" (Walker, 2006: 382). Third World political ecology is an analytical approach to understand "the politics of environmental change in the Third World" (Bryant and Bailey, 1997: 1). The previous chapter discussed how globalisation transformed the local landscape from multi-purpose agriculture to shrimp monoculture in response to demand in the First World but at the cost of widespread environmental degradation at the local level including through soil degradation and water pollution (Franke and Chasin, 1980; Watts, 1983; Islam and Wahab, 2000). The local livelihood scenario was converted and created social vulnerability to environmental hazards. The

present section critically analyses how the local people of Aila village are coping through adaptation to this politicised environment.

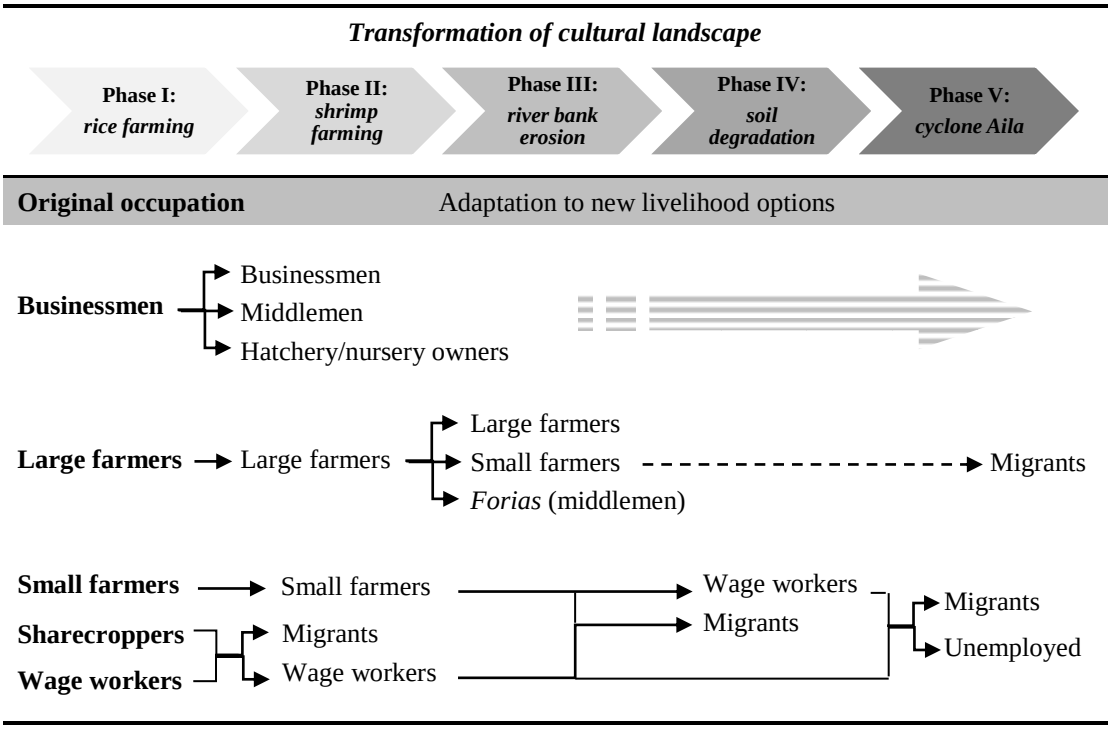
This has also been the case for other coastal areas in Bangladesh where shrimp farming was introduced in the 1980s such as Satkhira district including Aila village. It was found from the group discussions (FGD sessions 8 and 9) that initially some of the curious farmers who knew the demand of shrimp in foreign countries, collected wild shrimp from the River Marichchap, which were harvested in their rice farms. Within 25 years all rice fields were converted to shrimp farms at Aila village. The local people have also been encouraged to do this through government policy and NGO activities (see Chapter 7 for details).

Table 6.6 shows that the local people of Aila village had changed their livelihood strategies over the past three decades adapting to the politicised environment. Localised social factors, such as social class, local power structures, land ownership, and other factors also influenced *who*, *when* and *why* of change in their livelihoods.

The local elites who control the large shrimp farms and business premises gained from shrimp farming. It is salient to note that businessmen did not need to change their occupation as they sold basic essentials already. After introducing shrimp farming, the businessmen who traded in agricultural inputs, such as fertilizer and pesticide, now sell the inputs for shrimp farming, such as hutching nets and chemicals. Some elites obtained other types of new livelihood options, such as being middlemen in the supply chain and as hatchery or nursery[9] owners. The local elites entered into partnership with the external businessmen and set up hatcheries and nurseries for controlling the supply chain of shrimp production and withdrawing the lion's share of total profit. A middleman works in between the farmers and the processing plants. The bigger middlemen have their depots[10] whereas other middlemen have their sets[11]. The small middlemen get a commission of 2-5 percent. They also lend money to the farmers to prepare their farms. Since introducing shrimp farming, this group of elites have rarely ever changed their occupation and they are the most beneficiary class of the community.

[9] A hatchery is where the shrimp eggs are grown to the post-larvae (PL) stage followed by moving them to aerated tanks and then ponds for the later stages of their growth. Small shrimp are then transported to a nursery to become familiar with the local water before being released into shrimp farms.
[10] A depot is a big storage room where shrimp is boxed with ice and transported to a processing plant.
[11] A set is a small store where shrimp is boxed with ice and brought to a depot.

Table 6.6 | Hazardous transformation of the cultural landscape through local livelihood strategies



(Source: Author, drawn from the FGD sessions 8 and 9, fieldwork at Aila village, July-August, 2012)

Another group of elites who owned large agricultural lands easily became shrimp farmers as shrimp production gave them more money than rice production. The large farmers constructed canals to bring saline water from the nearest river to their farms through cutting the earthen river embankment in many points. Short-cuts and creation on an easier supply of saline water to the shrimp farms made the river embankment more fragile, and the resulting damage through river bank erosion was considerable. Many large farmers lost their lands into the river and became small scale farmers. Viral disease due to the high salinity of the soil reduced shrimp production in 1990s. The First World banned Bangladeshi shrimp as an imported good for few months in the late 1990s because of unhygienic production and processing. However, the small farmers survived until the landfall of Aila. Cyclone Aila brought more extensive amounts of saline water into their farms and the production of shrimp has declined. It was observed from the fieldwork that though they have not changed their livelihoods yet, it is quite likely that the farmers will migrate out of their village. Some of the

large farmers who lost land into the river, leased or sold their remaining lands to the other large farmers and became *Foria*[12], a kind of middleman.

In contrast, the poor small scale farmers and sharecroppers, and the extreme poor wage workers suffered more specifically as a result of the shrimp-culture in their area. Many small farmers also converted their rice farms to be shrimp farms, whilst the remainder of the small farmers were also forced by their neighbouring large farmers to switch to shrimp farming. Soil degradation due to high salinity forced them to lease or sell their lands, and to become wage workers or migrate to urban areas. The sharecroppers lost their entitlement of rice production as the leasing persons wanted to produce shrimp in their lands. The majority of sharecroppers decided to migrate rather than work at shrimp farms whereas most of the wage workers who worked at rice fields became workers at shrimp farms. Later some wage workers also lost their jobs under phase III and IV (Table 6.6) and migrated to urban areas. The migrants often live in urban slums and work for informal sectors such as construction sites, brick fields and rickshaw-pulling.

As with social class, the impact of shrimp farming differs from a gender perspective. Traditionally women worked in rice fields whilst new (shrimp) farming systems needed more vigorous efforts that many women refused to work with. Many women now work in shrimp processing plants[13] outside their village although they are underpaid compared to their male counterparts (Stenberg, 2012). The fieldwork revealed that the selling and auctioning stages of the shrimp supply chain are exclusively controlled by men. Thus, apart from work in processing plants, many women and young girls have migrated to Dhaka to work in the garment industry[14].

The local people of Aila village have therefore been adapted by new and forced livelihood opportunities since the introduction of shrimp farming in their locality. The elites control the supply chain of shrimp production and get the maximum profits. In contrast, the backward classes, particularly extremely poor households and women have least access to the supply chain and often need to change their livelihoods including by migrating to urban areas in this politicised environment.

[12] A *foria* often bargains on behalf of a farmer in a local market and gets a commission of 2-3 percent from the farmer. Sometimes a *foria* collects shrimp directly from a farm.

[13] Women share 60-80 percent of the total workforce in the shrimp processing plants in Bangladesh (Ahmed et al., 2007).

[14] According to the data of 2013-2013 published on the website of Bangladesh Garment Manufacturers and Exporters Association (BGMEA), the total manpower in BGMEA member factories is 4.0 million and 80 percent are women (BGMEA, 2015).

6.6 Summary

To implement an integrated DRR-CCA at local level it is important to understand local people's knowledge and practices and how these coping strategies may help in future adaptations. This chapter shows that local knowledge, experiences and practices that help communities with responding to environmental disasters and accelerate their capacities to adapt to future climate risks. The historically developed traditional knowledge and practices in Jamuna river basin helped the char-dwellers to adapt to seasonal climate variability and cope with the abnormalities of localised environmental disasters such as severe floods and river bank erosion. The char-dwellers follow three coping and adaptation strategies from a livelihood perspective: cropping pattern, livelihood diversification and seasonal migration (Chambers and Conway, 1991). The char-dwellers also have many gender-specific strategies and mechanisms for coping with disasters, particularly severe floods. They change their strategies time-to-time according to crisis severity and their access to local resources and institutions. Some of their strategies are not taken in their own interests but for wider socio-economic and political influence (Cannon, 1991). For example, selling labour in advance during flood periods is not always on a voluntary basis. Many people look for work; thus the richer can easily hire the poor, particularly women, and negotiate a settlement with them for a lower wage rate.

The present study reveals that the coastal communities failed to prepare for and respond to cyclone Sidr due to lack of hazard-specific stable knowledge and practices. The failure of EWS and evacuation orders also accelerated the situation. Two years later the same community properly responded to cyclone Aila by using their recent experience although the EWS whilst evacuation orders of CPP were instrumental at local level. In contrast, the people of Aila village failed to respond to cyclone Aila. The local perception of the occurrence of Aila is a result of climate change that is embedded by the external actors of DRR–CCA. Such post-Aila development scenarios continue to neglect the transformation of the cultural landscape from rice farming to shrimp farming and its long-term impacts on local livelihoods. The local people, particularly the poor and women of Aila village, got only a minimal chance to utilise their traditional knowledge and practices through this adaptation, whilst local elites made the maximum profits from their shrimp supply chain.

Like the people of Aila village, the people of Sidr village believe Sidr and Aila occurred due to climate change and they should be compensated by those who are responsible for it. The char-dwellers tried to understand climate change the way they observe seasonality in their day-to-day life and experience adverse impacts of environmental disasters. Though the perception of climate change of the char-dwellers differs from the cyclone survivors, the char-dwellers assume future climate risks in terms of high frequency and magnitude of extreme events can modify their traditional knowledge and practices and that this may increase relief dependency.

In the context of policy formulation and programme implementation, this chapter shows that both DRR and CCA staff should consider community responses to environmental hazards in normal periods and in emergencies and their distinct variation in terms of spatial and socio-political differences. However, local vulnerability and capacity also depends on external interventions and how the disaster survivors cope with resultant activities associated with globalisation of the economy. In the DRR-CCA context, many new programmes and projects are being implemented in disaster prone areas through existing local disaster management expertise. The next chapter will explore how the local people and local experts cope with this new era of implementing DRR-CCA.

Chapter Seven

The DRR and CCA conundrum of national policy making and local level action in rural Bangladesh

CHAPTER SEVEN

The DRR and CCA conundrum of national policy making and local level action in rural Bangladesh

7.1 Introduction

Chapter 3 revealed the historical development of disaster management in Bangladesh and how this process has influenced a shifting paradigm – from emergency response to a holistic disaster management approach. The government and development partners, including local NGOs, run several development activities variously aimed at reducing people's vulnerability and enhancing their capacity. Nowadays these actors are also concerned about the potential risks of climate change. CCA is being incorporated in their regular activities and recent programmes. Both the government and NGOs are working to implement an integrated DRR–CCA from national to local level. To further explore potential transformations of local cultural landscapes through external interventions, this chapter attempts to answer the following sub-questions: how have international and national policies and programmes of DRR–CCA been implemented at local level and to what extent are the communities benefitting by coping with disasters in these contexts? The question comprises three aspects to: (i) understand the process of how international and national policies are implemented at local level; (ii) explore the recent initiatives taken through implementing an integrated DRR–CCA at the local level; and (iii) investigate the opportunities and challenges of these external interventions on communities in terms of their vulnerability and adaptive capacity.

This is important to understand how to reduce community dependency on external assistance and how their disaster and climate resilience can be improved. It is also important to understand how local level development practitioners including both government and NGO staff utilise their experiences of disaster management in climate change projects. This chapter therefore provides an understanding based on grounded information from this research to enable recommendations. These will hopefully be useful in improving and existing policies and action plans extending to international policies and knowledge through the experiences in Bangladesh.

7.2 Policy frameworks of DRR and CCA

Contemporary international law such as human rights law and conventions such as UNFCCC and the United Nations Convention to Combat Desertification, contain legal norms and obligations that can assist to motivate, justify and facilitate relevant frameworks and protocols of DRR and CCA. In particular, the Kyoto Protocol and the Sendai Framework for Disaster Risk Reduction 2015–2030 serve to legitimise the integrating of DRR and CCA from international to local levels (IPCC, 2012). The Government of Bangladesh has already signed and ratified all international conventions and protocols related to DRR and CCA. Development partners, such as for example CARE International and the World Bank at international level implement their policies through their national and local partners. There are a number of actors at national level, namely national governments, civil society, the private sector, scientific and research organisations that work to reduce climate-related disaster risks (Schipper, 2009). Chapter 3 also discussed the DRR and CCA related activities of the national level actors in Bangladesh. The present section critically discusses the national policy framework in terms of mainstreaming an integrated DRR–CCA approach.

Though the country has a historical experience of disaster management, the government had no legislative obligation until 2010. The Standing Orders on Disasters (SOD) was first published in 1997 in Bangla and revised in 2010 in accordance with the changed circumstances. SOD describes the detailed roles and responsibilities of the committees, ministries, government departments and other organisations involved in DRR and emergency response management (GoB, 2010b). In 2010, the government approved the National Plan for Disaster Management 2010-2015 (NPDM) that has established a national regulatory framework for disaster management and identified the priority areas of DRR, with strategic goals drawn from the SAARC comprehensive regional framework on disaster management[15] (GoB, 2010a). In 2012, the government approved and ratified the Disaster Management Act that creates the legislative framework for DRR related activities and actions under the government institutional setting in Bangladesh (GoB, 2012). In addition, there are some specific guidelines for the government at all levels developed as best practice models for assisting the stakeholders concerned (Table 7.1). Recently the government has

[15] A comprehensive regional framework on disaster management in South Asia titled "Disaster Management in South Asia: A Framework for Action 2006-2015 (2006-2015)", aligned with the Hyogo Framework of Action (2005-2015), was adopted in 2006 to address the specific needs of disaster risk reduction and management in South Asia. (SAARC, 2006)

formulated the National Disaster Management Policy for adopting a strategic policy framework and national principles of DRR in Bangladesh (GoB, 2015).

Table 7.1 | Guidelines for the government at all levels

Guidelines for the government
Planning:
Contingency Planning Template
Sectoral Disaster Risk Reduction Planning Template
Natural Disaster Risk Incorporated Local Level Planning Template
Preparedness and response:
Indigenous Coping Mechanism Guidebook
Guideline for Disaster Shelter Management
Guidelines for Road, Water, Industrial and Fire safety
Multi-Agency Disaster Incident Management Guideline
Emergency Response Management Guideline
Implementation Guideline for Humanitarian Assistance
Guideline for International Assistance Management in Disaster Emergency
Local Disaster Risk Reduction and Emergency Fund Management Guidelines
Risk reduction: (structural)
Guideline for Rural Infrastructure Maintenance Programme (Test Relief)
Guideline for Rural Infrastructure Repairing Programme (Food for Work)
Guideline for Flood Shelter Construction
Cyclone Shelter Construction, Maintenance and Management Policy 2011
Risk and disaster assessments:
Hazard Specific Risk Assessment Guidelines for Earthquake, Flood, Cyclone, Fire, Drought etc.
Disaster Impact, Damage, Loss and Need Assessment Guideline
Community Risk Assessment (CRA) Guideline
Information management:
Disaster Information Management Guideline
Emergency Response and Information Management Guideline
Monitoring and Evaluation Guideline for the Implementation of the Plan

(Source: adapted from GoB, 2010b; 2015e)

In terms of policy frameworking for CCA, Bangladesh is one of the first countries to develop and adopt the National Adaptation Programme of Action (NAPA) in 2005 for

mainstreaming adaptation into the national development planning and processes (GoB, 2005). The NAPA was updated in 2009 proposing nine short-term and nine medium-term projects (Ayers et al., 2014). Though the NAPA is generally well known, it is criticised for adopting a relatively isolated adaptation strategy through specific adaptation projects (ibid.). A comprehensive Capacity Development Action Plan (CDAP) for sustainable environment governance has been developed in 2007 through the National Capacity Self-Assessment (NCSA) for implementing the provisions of multilateral agreements including the UNFCCC (GoB, 2007). The action plan prioritises three thematic areas: climate change, biodiversity and land degradation. The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) was prepared and adopted in 2008; and it was updated in 2009 for incorporating the Vision 2021[16] of the government. Both DRR and CCA are also being incorporated into general development planning. Vision 2021 is being implemented through two medium-term developments: the National Perspective Plan 2010-2021 and the Sixth Five Year Plan 2011-2015 (GoB, 2011, 2012b). All three planning documents have chapters on integration of DRR and CCA.

7.3 Institutional response to policy frameworks at local level: Major actors, programmes and finance

The government is the key actor in addressing disaster management and climate change. Chapter 3 has described the institutional setting of GoB for functioning different activities of DRR and CCA. The Department of Disaster Management (DDM) under the Ministry of Disaster Management and Relief (MoDMR) is the focal point of the government for implementing the policies and actions of DRR to the local level. In addition, the Cyclone Preparedness Programme (CPP) works for implementing government policy to disseminate early warning up to community level and evacuate communities to safe buildings, particularly cyclone shelters. The

[16] The Centre for Policy Dialogue (CPD), a civic society think tank in Bangladesh, organised a dialogue entitled "National Election 2007: Civil Society Initiative for Accountable Development" on 20 March 2006 in Dhaka. Nagorik Committee 2006 a citizen's group was formed at this dialogue and entrusted to prepare a vision for Bangladesh underlining the key strategic goals. The purpose of the Vision Paper is to project an image of Bangladesh in 2021 that meets the hopes and aspirations of the citizens of the country for an economically inclusive and politically accountable society. The vision paper indicates a set of measures to achieve the eight identified goals by 2021. The Bangladesh Awami League, the present ruling party, declared the Vision 2021 as its political manifesto before winning the National Election of 2008. Apart from political criticisms, the government still considers the Vision 2021 is a power wheel of the national development plan of action (CPD, 2007; GoB, 2012b).

government initiatives at local level can be divided into three broader thematic areas: social safety net, humanitarian assistance and DRR (Table 7.2). Social safety net programmes (SSNPs) are usually implemented at the post-disaster recovery and reconstruction phase. The aim of SSNPs is to create seasonal localised employment opportunities and ensure food supply and security through rural infrastructural maintenance and repairing (GoB, 2014ab). However, some all-year-round SSNPs operate that also help the extremely poor households to cope with disaster losses and damage. The government also provides humanitarian assistance amongst affected people during and after disasters. In the 2015-2016 fiscal year, the government has decided to distribute housing materials to 40,050 disaster affected families across the country, a bundle of corrugated galvanised iron sheets and BDT 3,000.00, for repairing their damaged houses (GoB, 2015d).

Table 7.2 | Current institutional response to DRR at local level

Thematic areas	Functions/projects
Social safety nets	Test Relief (TR)
	Food for Work (FFW)
Humanitarian assistance	Gratuitous Relief (GR)
	Cash for Housing
	Vulnerable Group Feeding (VGF)
DRR	ADP funded projects
	Donor funded projects
	CPP activities

(Source: Author developed from the fieldwork in Bangladesh, January-September 2012 and December 2012-March 2013)

Considering national policy frameworks, the Planning Commission incorporates DRR and CCA into the Annual Development Programme (ADP). At present there are 57 DRR and 17 CCA focused ADP funded projects in different sectors (GoB, 2015a) (Table 7.3). However, the government has established two separated funding mechanisms to implement the strategies and actions of BCCSAP: the Bangladesh Climate Change Trust Fund (BCCTF) and the Bangladesh Climate Change Resilience Fund (BCCRF) (BCCRF, 2015; BCCT, 2015).

Table 7.3 | Approved ADP projects (2015-2016) addressing DRR and CCA

Sectors	DRR	CCA
Agriculture	7	6
Education	2	0
Infrastructure	2	1
Public administration	4	0
Rural development	2	4
Water	27	1
Foreign aid*	13	5
Total	57	17

* Development partners have financed 18 projects through the Planning Commission

(Source: Planning Commission, GoB, 2015a)

The BCCTF was established by the Bangladesh Climate Change Trust Fund Act of 2010 and is a block budgetary allocation from revenue flows (BCCT, 2015). Since the 2009-2010 fiscal year, the government has allocated a total of BDT 29.0 billion (£234.8 million[17]) to BCCTF. Table 7.4 shows 190 out of 236 approved projects are directly related with disaster management, primarily disaster resilient structural developments while 15 are forestation projects also focused on protecting coastal communities from tropical cyclones. The rest of the 31 projects are principally either for institutional capacity building or for utilising energy efficient cooking stoves and solar panels in disaster prone areas. It is understood climate funds are being utilised for DRR activities. Although the original plan of the government was to ensure community participation in BCCTF projects, the fieldwork for this research found that not a single project registered such an intention in their project proposal.

[17] Buying rate on 21/06/2015 £1 = BDT 123.5075 (Bangladesh Bank, 2015)

Table 7.4 | Sector or hazard specific projects under BCCTF

Hazards or sectors	Number of projects
Floods	40
Cyclones	35
River/coastal erosion	63
Droughts	4
Salinity	5
Water logging	29
Other hazards	14
Afforestation	15
Non-hazards	31
Total	**236**

(Source: BCCTF, 2014)

Table 7.5 | Contribution of development partners to BCCRF (as of 31 December 2013)

Development partners	Pledged amount in US$ (million)	Deposited amount in US$ (million)	Ratio of unpaid contribution (%)
AusAID	7.1	7.1	0%
Denmark	1.8	1.8	0%
DFID (UK)	96.0	66.4	28%
EU	37.1	18.5	50%
Sweden	19.3	19.3	0%
Swiss	12.6	8.2	35%
USAID	13.0	9.0	31%
Total	**186.8**	**130.2**	**30%**

(Source: BCCRF, 2014)

With a view to developing a medium- to long-term programme for enhancing climate resilience and assisting low carbon development, Bangladesh launched its first BCCSAP at the UK-Bangladesh Climate Change Conference in London in 2008 (BCCRF, 2015). Drawing inspiration from the London conference, a multi-donor trust fund for climate change was proposed as a modality for the development partners to support Bangladesh in implementing the BCCSAP. Thus, the BCCRF, with

contributions from the donors was established in 2010 following the signature of a Memorandum of Understanding (ibid.). Though the donors pledged to contribute $186.8 million for 13 approved projects, until December 2013, a total of $130.2 million has been deposited (Table 7.5).

Apart from the government, there are many national and international NGOs working in the field of DRR and CCA in Bangladesh. It was observed through the fieldwork that three major programmes, the River Basin Programme (RBP), Strengthening Household Ability to Respond to Development Opportunities (SHOUHARDO) (literally meaning friendship) and Chars Livelihoods Programme (CLP) have been implemented by INGOs in the Jamuna river basin since 1999, including for enhancing community capacity to cope with disasters through livelihood and food security. The government and NGOs often work together due to the nature of their actions. For example, CDMP was jointly implemented during 2004-15 by the government and development partners. Chapter 3 presented the institutional setting and activities of CDMP. NGOs also develop partnerships amongst themselves addressing common issues. The National Alliance for Risk Reduction and Response Initiative (NARRI), a consortium of 10 INGOs working on DRR and emergency response in Bangladesh was established in 2010 (NAARI, 2015a). The INGOs are namely ActionAid International, Care International, Concern Universal, Concern Worldwide, Islamic Relief Worldwide, Oxfam International, Plan International, Solidarities' International, HelpAge International and Handicap International. To embed a strong disaster and climate resilient culture and response capacity in Bangladesh by 2020, NARRI operates many activities and projects. There are a number of projects operating in the study areas under the DIPECHO VI Action Plan in Bangladesh[18] (Table 7.6). It was also observed during the fieldwork that local NGOs operated their regular functions, particularly microcredit schemes that help the rural women of the extremely poor households during lean periods.

[18] The European Commission Directorate General for Humanitarian Aid Department (DG ECHO) set up the Disaster Preparedness European Commission's Humanitarian Aidr Department (DIPECHO) to improve the capacities of communities at risk in better preparedness and response. DIPECHO projects are implementing by the Europe-based aid agencies in cooperation with local NGOs. The DIPECHO VI Action Plan in Bangladesh launched from March 2013 with a principal objective to institutionalise the Community Based Disaster Preparedness (CBDP) models in urban and rural areas (NARRI, 2015b).

Table 7.6 | The activities of DIPECHO projects at study areas

Project title	Partners	District	Activities
Building a Disaster Resilient Bangladesh	ActionAid Bangladesh	Satkhira	• Replicate a rural CBDRR model through integration into development planning and implementation processes • Establish effective linkages and strengthen systems and structures at national and sub-national level for effective DRR humanitarian interventions • Implement DM policy framework though strong coordination and evidence based advocacy to the government
	Concern Worldwide	Sirajgonj	
	Solidarities International	Barguna	

(Source: Fieldwork in Bangladesh, January-September 2012 and December 2012-March 2013; NARRI, 2015b)

7.4 Politics in local level intervention: Community challenges and response

Evidence shows that there are often some differences between expected outputs and real outputs of development programmes around the world, particularly in the developing countries, that can be referred to as the "implementation gap" (Grinndle, 1980; Turner and Hulme, 1997; UNECA, 2012). Donors and INGOs often design their programmes focusing on international agreements and aims of the governments of the developed countries. Activities of development partners sometimes are overlapped. For example, three development partners work in the Jamuna river basin with overlapped aims and objectives. Oxfam GB operated RBP (1999-2007) in the char-lands of Jamuna river basin for increasing coping capacity of floods survivors through sustainable livelihoods (Oxfam GB, 2010). Since 2004 another two big projects have been operating in the same river basin: CLP and SHOUHARDO (CARE Bangladesh, 2015; CLP, 2015).

RBP focused on "vulnerability reduction" through enhancing community coping capacity and livelihood options whereas SHOUHARDO and CLP primarily focused on "food security" and "sustainable livelihood" through transferring assets such as livestock, poultry and home gardening (Table 7.7).

Table 7.7 | Comparison between strategic objectives and activities of major donor funded programmes in Jamuna river basin

Description	RBP	SHOUHARDO	CLP
Funder	Oxfam GB	USAID	DFID & AusAID
Implementing agencies	Oxfam GB	CARE Bangladesh	Maxwell Stamp PCL
Duration	1999-2007	1st phase: 2004-2010 2nd phase: 2010-	1st phase: 2004-2010 2nd phase: 2010-2016
Coverage area (Number of districts)	11	1st phase: 18 2nd phase: 11	1st phase: 5 2nd phase: 8
Number of families (total Beneficiaries)	40,000 (300,000)	1st: 400,00 2nd: 370,000	1st: 55,000 (900,000) 2nd: 78,000 (1,000,000+)
Strategic objectives (the major objectives on initial stage are highlighted in **bold** type)	• **Reduce flood vulnerability** • **Increase coping capacity** • Enhance livelihood options • Influence to change for community friendly policies & practices	• **Increase food security through sustainable livelihoods** • **Improve health, hygiene & nutrition status** • Women's empowerment • Institutional strengthening • DRR & CCA	• **Promoting sustainable livelihoods** • Improving markets for the poor • Protecting communities from floods and erosion • Increasing access to WATSAN • **Improving food security & improving good nutrition** • Supporting women's empowerment & social development
Activities (the major activities at the initial stage are highlighted in **bold** type)	• **Raising household plinths** • **WATSAN facilities** • Emergency relief • Strengthening local DM committees • **Training & capacity building**	• **Asset transfer (i.e. homestead gardening)** • Raising household plinths • **WATSAN facilities** • Emergency relief • Strengthening local DM committees • **Training & capacity building** • Market improvement	• **Asset transfer (i.e. livestock rearing)** • Raising household plinths • **WATSAN facilities** • Emergency relief • **Training & capacity building** • Market development

(Source: Oxfam GB, 2010; Fieldwork at Bonna village, January-September 2012 and December 2012-March 2013; CARE Bangladesh, 2015; CLP, 2015)

SHOUHARDO and CLP have also incorporated a specific DRR approach in their activities. For example, raising homestead plinths is an effective DRR approach to reduce flood vulnerability in flood prone areas. After its initiation by RBP, the approach has also been implemented by the other two development partners (Oxfam

GB, 2010). It was understood from the group discussion at Bonna village (FGD session 1) that the char-dwellers prefer raising the plinth of their houses to constructing flood shelters. Few respondents of the FGD session (6 out of 22) stayed in the nearest flood shelter during the flood of 2007; and three of them moved to their relatives' in the mainland. They argued that the condition of the shelter is not good, particularly for women and young girls to live. According to the capacity of standard flood shelters (400-500 people), a minimum of 5-6 shelters are needed at Bonna village. The char-dwellers replied that land acquisition for 5-6 flood shelters is very difficult for the village because the suitable places to build shelters are almost public land and they might not agree to donate. They also refused the possibility of using *Khas*-lands (state owned lands) because the accessibility and location of the khas-lands. The programmes also faced some challenges in terms of selecting locations and beneficiaries. An interview with an NGO staff member revealed that sometimes the implementing agencies selected the same village and even a less important village in terms of the poverty index. INGOs often follow bureaucratic decisions rather than the feedback of their local partner NGOs. In addition, local elites often influence beneficiary selection processes that sometimes misguide NGOs in selecting actual beneficiaries.

At the national level, the government often allocates development budgets according to their political commitments. At local level, the government implements its regular activities and development programmes and projects through 25 government departments at Upazila level. Though the concerned Upazila Parishad (UzP) has legal authority to supervise the government activities at Upazila level, the council hardly perform it. In practice, most of the activities of the Upazila offices are derived from their concerned higher authority (district offices) as they work for the (central) government. In addition, recently the government gave the authority to the concerned Member of the Parliament (MP) for working as an advisor of the UzP. It was observed from the fieldwork that this government decision has created an unbalanced power structure between lawmakers and local governments. It was further observed that the relationships between MPs and chairmen of Upazila councils are often not warm. Both groups have political interests and they want to be involved in development activities so that their presence can be praised by their vote banks and other people. Thus, field level government officials play technical roles in most cases.

the field level government officials are more accountable to the [central] government through their respective departments under different ministries rather than local governments. Their intention is to implement government policies based on available funds and resources that leads to a chaotic environment between the field level government officials and local governments. According to the legislative power, although the chairman of an Upazila council can supervise the activities of the departments under his or her jurisdiction, he often needs to burgain with the government departments to ensure enough fund allocation in his area. The vice chairpersons have less influence in decision-making processes than the chairmen.

> "The government officials hardly consider our opinions as they are primarily responsible to implement the orders of their higher officials." (Interviewee 23: the Female Vice Chairperson aged 42, Ashashuni Upazila Parishad, December 2012 – March 2013)

> "We neither collect tax nor get [directly] enough grants from the government. So, we pursue the government officers for allocating more grants for our respective areas." (Interviwee 14: the local leader, Sidr, January–September 2012)

> "Our projects operate by external assistance; so we have to strictly follow donors' guidance. Besides, field administration of the government and local leaders also influence our activities" (Interviwee 21: An NGO Manager aged 55, Chauhali, March–May 2012)

At the union level, being the bottom tier of local government of Bangladesh, a Union Parishad (UP) has no legislative power to supervise the government functions at its own jurisdiction. It was observed from the fieldwork that UP representatives always try to maintain close relationships with government officers at Upazila level pursuing them to allocate more grants in their localities. There was a minimal allocation of development grants for all local governments in the national budget for the 2014-2015 fiscal year (13.6 billion Taka – 1.58% of total development budget) and the grant for UPs (only 0.1 billion Taka – less than 0.01% of total budget) was negligible compared to UzPs (4.2 billion Taka – 0.49% of total budget) and Zila Parishads (3.7 billion Taka – 0.43% of total budget) (Planning Commission, 2015). Despite a potential source of earnings UPs hardly bother to collect their housing tax due to their political commitments to voters. Thus, they build healthy relationships with both UzP and government officials for getting more allocation for their areas.

Donors often implement their policies through local NGOs but the government can monitor their activities. Thus, field administration directly supervises and reviews NGO activities at local level. Further, to achieve the goals, local institutions and elites are often incorporated into planning and implementation processes of their community activies.

The Department of Disaster Management (DDM) under the Ministry of Disaster Management and Relief (MoDMR) has their Upazila level administrative setup. The functions of the department are divided into three categories: humanitarian assistance (i.e. relief programme), social safety net (i.e. Food for Work) and risk reduction programmes (i.e. flood and cyclone shelter building). DDM has already established 99 flood shelters with another 173 shelters under construction (DDM, 2015). Additionally, 100 multi-purpose cyclone shelters along the coastal belt are being established. It was observed that the Project Implementation Officer (PIO), the administrative head of the department at Upazila level, is recruited from a (civil) engineering background. The activities of the department at local level are strictly supervised by the Upazila Nirbahi Officer (UNO), who is the chief executive officer to the (central) government at Upazila level.

The functions of DDM at the local level include relief work in emergency and infrastructural reconstruction activities. Local elites are interested in these processes of structural construction and maintenance, and indeed they often control the mechanisms. It was observed from the fieldwork that the local elites have the influential capabilities to modify the original plans for their own interests. Thus, not only political motives but also corruption causes malfunction of the activities of DDM and other departments working for disaster management. For example, recently an embankment collapsed along the Jamuna river in Bogra district near Bonna village, one of the study villages (The Daily Prothom Alo, 2015) (Figure 7.1). Agricultural lands at six villages were flooded and the villagers assumed losses on a massive scale. Such embankment collapse happened four times in the last four years in the area. Though the concerned government official claimed that flash flood is the main reason for this accident, the local people argued that low quality construction materials and the wrong timing of repair are the causes for embankment collapse.

Figure 7.1 | The earthen embankment collapsed whilst being repaired in June 2015 near Bonna village

(Source: The Daily Prothom Alo, 2015)

It has already been reported that the BCCTF is the largest government financing mechanism for climate change mitigation and adaptation initiatives. Figure 7.2 shows clear regional disparity in project distribution. The coastal three divisions have been allocated 117 projects while only 31 projects have been implemented in the northern three divisions (Rangpur, Rajshahi and Sylhet). The hub of national politics, Dhaka division, has been distributed 45 projects and another 43 projects either cover more than one division or did not mention any name of division. The distribution also indicates that the experts for project proposals and approval processes were highly influenced by cyclones Sidr and Aila. Most of the cyclone, coastal erosion and water logging related projects are aiming to recover from climate change induced cyclone impacts on the coastal belt. The national level experts are able to motivate the local level practitioners that Sidr and Aila were an act of climate change as along the lines discussed in this thesis.

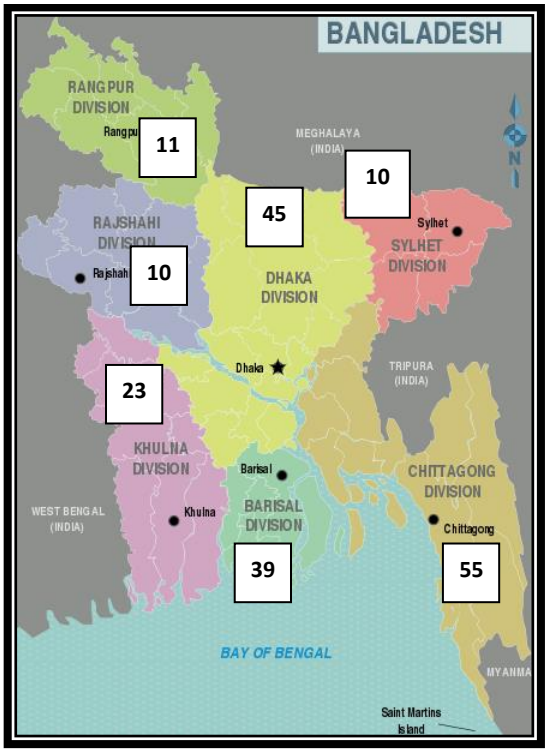


Figure 7.2 | Administrative division wise BCCTF project distribution in Bangladesh

(Source: Author)

Some other hazards such as droughts and flash floods were ignored by the climate fund. It is also observed that the approved projects tend to focus on engineering solutions as in the early phase of Bangladesh's history of disaster mitigation, such as flood control and river and coastal protection. These were often charged for corruption and malfunction, and the local communities rarely get access to the planning processes. Also, the clear suggestion is that BCCTF projects are primarily reactive initiatives for recovering from recent disaster damage and losses rather than proactive actions for climate change adaptation.

Political and bureaucratic clashes between the lawmakers, local leaders and government officials influence local level government activities in terms of project site and beneficiary selection, schedule and budget allocation. Furthermore, corruption is visible in the government planning and implementation processes that can modify original plans and decisions of local level activities; thus inappropriate implementation of national policies and programmes often wastes a subtantial amount of public funds. At the community level, it has already been discussed how local elites control the local power structures and institutions. In contrast, vulnerable people

usually get least access to the system (Wisner et al, 2004; Collins, 2009). The complex socio-political scenario generates a suitable ground for opportunist groups to collect benefits while the extremely poor households hardly get benefits from external interventions and become dependent on relief. Apart from the government intervention, development partners including NGOs are also involved in DRR–CCA initiatives. Development partners and INGOs generally implement their activities through local NGOs as the latter have healthy relationships with local people. However, they execute their projects and programmes maintaining a close tie with local political institutions. Apart from socio-political concerns, these activities often depend on physical characteristics of disasters and their spatial and temporal dimensions. The study has focused on both floods and tropical cyclones to understand how external interventions differ at the local level in terms of disaster management and recent DRR–CCA discourse. It shows in this context that there are "implementation gaps" between initial policies and implemented activities, and that this may hamper the processes of integrating DRR and CCA at local level. How communities respond to external interventions are important to identify the nature of supporting environments that would be needed for the integration process. Community response often varies depending on how locally situated people cope with environmental hazards and adapt to longitudinal socio-cultural changes.

7.5 Paradigm shift in the chars of Jamuna: From emergency response to livelihood centred disaster management

The nature-based life and livelihoods of the char-dwellers on Jamuna chars are unique. Previous chapters discussed the char-dwellers' vulnerabilities to environmental disasters (Chapter 5) and their coping strategies and mechanisms based on their inherited knowledge and experiences (Chapter 6). Besides their own initiatives, external inventions also assist them in coping with disasters and recovering from losses and damage. Thus, it is important to understand how and why the strategies of external inventions change over time and how the flood and river erosion survivors cope with such activities.

Relief work in the char-lands of Jamuna river basin is a conventional responsive strategy as in other parts of the world. Both the government and development partners generally operate their relief programmes through local government and NGOs. Many local NGOs have been established primarily based on relief programmes. Though

there are many other development activities, it was observed from the fieldwork that relief is still one of the main functions. It was agreed by the participants of the FGD sessions at Bonna village that relief dependency is an inherited strategy of the char-dwellers. Socio-political dimensions of relief work during and after floods influence the life of the char-dwellers. During severe floods, armed forces associated with civil administration are usually involved in relief operations to control any unexpected situations such as food rioting and looting. Local governments and NGOs are included in the relief operations later, particularly when the severe flood situation is over. However, the participants of the FGD sessions argued that nowadays local NGOs along with local institutions start their works just after flood occurrence.

> "Actually we work with local people all around the year; so we have healthy relationship with them. We can work any time even in crisis periods like military." (Interviewee 17: the NGO worker at Bonna village, March–May 2012)

> "Earlier people treated us as *Gom Chor* (wheat thief) but now they realise our efforts for them. We have to persuade both government officials and NGOs to continue the development process of our area." (Interviewee 13: the representative of local government at Bonna village, February 2013)

It is understood from the above statements that local institutions and NGOs conduct their activities all through the year. Such activities include not only emergency response but also actions taken in preparedness phases such as awareness building and skill development programmes that indicate how the paradigm shift in disaster management policy has influenced changing local level interventions. Integrated disaster management in flood prone char-lands also helps in changing not only the work patterns of local institutions but also the personal attitudes of local leaders. As in the above statement of the local government representative it was observed that local people often treated local politicians as corrupt persons and such an attitude hampered their relationship. The paradigm shift in disaster management has also reduced the dependency on government institutions and given access to communities to the activities of development partners and NGOs. However, local elites often influence the development process. It was understood from the FGD sessions that external inventions during floods are often successful in connection with fulfilling people needs and minimising crisis situations. Pre-disaster preparedness and post-disaster reconstruction actions often malfunction as they are technical solutions primarily

designed and assessed by experts of the government and local people are hardly involved in such processes (Table 7.8).

Table 7.8 | Comparison between government and nongovernmental disaster management interventions

Items	Government	NGO
Aims and objectives	Political commitments	Vision and mission of development partners
	Implementation of national policies	Implementation of international agreements
Source of funding	Fund allocation from national development budget	Donor funded
Strategies	Long term plan	Short term project oriented plan
	Implementing through government departments in association with local institutions	Implementing through local NGOs in association with local institutions
	Primarily focused on engineering solutions	Often soft solutions
	Technical science-based	Social science oriented
	Technically top-down approach	Community-based bottom-up approach
	Total community approach	Target group approach
Outputs and outcomes	Massive relief operation during severe floods	Relief work during and especially after severe floods
	Creating localised seasonal employment at pre-flood period	Assisting community in creating their own assets
	Often malfunction due to corruption and colonial bureaucratic system	Rarely involves whole community due to fulfilling project targets

(Source: Author developed from fieldwork at Bonna village, February 2013)

It was also observed that NGO activities are comparatively well-planned and project oriented, and local people benefit (e.g. raising household plinths) although these activities are often target oriented to fulfil donors' interests. Conversely, the government actions usually depend on fund allocation and releasing. Traditional bureaucratic systems take a long time to release funds in time and so the last quarter of a fiscal year (April–June) is often treated as the implementation period of government

activities. Photograph 7.1 has already showed up how an embankment has collapsed due to delays in the disbursement of funds causing the local communities to be more vulnerable to flood risks. Regular floods in the Jamuna river basin occur in June-July and give sufficient time for implementing pre-flood preparedness actions but early floods often damage such initiatives and increase people's vulnerability. These external inventions create employment opportunities (e.g. earth digging) for local people and they get food or cash to survive during severe floods.

The functions of development partners help communities to reduce community crises. For example, through "asset transfer" schemes development partners provide livestock and other agricultural inputs. Additionally, raising house plinths above the 1988 and 1998 floodwater level helps the flood survivors to protect their own lives and livelihood assets. However, it was observed that these initiatives often target the vulnerable group inspired by the concept of "the poorest of the poor". Generally, such projects select 25-50 percent of the total population as potential beneficiaries whereas the rest of the community which is also vulnerable are often neglected. Figure 7.3 shows how target oriented projects interfere with community cohesion by enhancing one group's adaptive capacity while increasing vulnerability for other groups. The owner of the right side household in the photograph was selected as an extreme poor case and provided an "asset transfer" package including galvanised corrugated sheet for the house and cowshed along with raising of the house plinth, hand pumped tube-well (borehole), sanitary latrine, one young cow and her maintenance allowance, and inputs for kitchen gardening and relevant skill development trainings. On the other hand, the owner of the left side house in the photograph was excluded from the beneficiary list as she had a cow during the selection processes. It was observed that the five-member family live in two tiny sized bedrooms and the cow live in the same room with them. The house has no proper latrine and drinking water facility and it still remains under the normal floodwater level. It was also observed that though the household owners claimed that they have a strong neighbourhood, that the members of the left side house rarely visit their neighbour's. They are allowed to collect drinking water from their neighbour's tube-well only during the daytime. Indeed, the relationship is not like it was before although one of the objectives of the project was strengthening of neighbourhoods amongst the vulnerable groups by utilising common property.

Figure 7.3 | Socioeconomic differences between two neighbours after external intervention

(Source: Fieldwork at Bonna village, March–May 2012)

It is understood from the above discussion that the paradigm shifting of disaster management in the chars of the Jamuna River assists flood survivors to reduce their relief dependency. The government structural interventions to reduce disaster risk creates seasonal livelihood opportunities during the pre-monsoon period but fails to achieve its full aims due to corruption and bureaucratic malfunction. By way of contrast, it has shown how NGO activities often focus on livelihood asset building mechanisms, although these short term target-oriented approaches can put sizable numbers of flood survivors at extreme risk. Livelihood-based disaster management approaches have been conceptualised using the "Rural Livelihood Framework" (Chambers, 1992). Chapter 6 critically discussed how the char-dwellers cope with floods and river erosion regarding their livelihood strategies and options. The concept of "the poorest of the poor" influenced development partners in selecting the most vulnerable group but they often want to cover substantially large areas. Thus, a "whole-of-society" approach is needed not only to obtain the success of livelihood centred disaster management but also to enhance the working environment amongst all stakeholders working at local level.

7.6 Cyclone Management in coastal Bangladesh: 'Community-based' or 'local level' model and the lessons learnt from cyclone Sidr

The government in association with development partners has been implementing a community-based cyclone management programme along the coast of the country since Cyclone Gorki in 1991. Coastal Bangladesh is one of the most tropical cyclone prone areas in the world. The country is internationally renowned for its great effort in building more than 4,000 cyclone shelters along the coast and its CPP model for disseminating cyclone early warning messages to community level and rescuing them to safer places (CPP/GoB, 2015a). The government claims that they were able to reduce death tolls in recent times whereas Paul (2012) argues that there are other factors such as timing and physical characteristics of cyclones and Sunderbans that worked as a natural barrier.

Chapter 6 discussed how communities responded to early warning before Sidr. It was found that more than one-third of the respondents at Sidr village in Barguna district (38%) did not receive any early warning. Roughly two-third of those who received the early warning (61%), believed it. Further it was found from the FGD at Sidr village that CPP volunteers warned people through using hand held microphones along the main roads of the village and, thus, people who lived in remote places did not receive early warning. They also argued that they received a false signal two days earlier which misled them in the actual event. Thus, the early warning signals disseminated before Sidr failed to convince them to move to cyclone shelters. The local CPP volunteer argued that he did not get enough time to cover the whole area although he used a megaphone to disseminate early warnings.

The previous chapter reported that only 20 percent of the respondents (10 out of 50 participants) stayed in cyclone shelters during Sidr and that the location and design of the shelters, road connectivity and cultural sensitiveness are the main reasons behind this. It was observed that the sole cyclone shelter owned by an NGO is situated in the northern part of the village. The NGO beneficiaries, particularly who live in the surrounding area sought shelter there while people who live in the southern part of the village stayed in either their own houses or their neighbour's.

> "I was scared to see the sudden weather change but I didn't get any early warning... I took my two children and ran away to my neighbour's house. I didn't get time to go to the shelter as it is far away from my house." (Interviewee 7: the female Sidr survivor at Sidr village, June–July 2012)

It is understood from the above statement that the family was not covered by CPP EWS and they have least access to cyclone shelters which challenges the government success story of cyclone preparedness and response. However, her actions of seeking shelter in neighbour's safe house indicates that the concept of building large cyclone shelters may be replaced by the concept of building small scale resilient settlements for vulnerable groups. The government and some development partners have been constructing such "climate resilient settlement" schemes in many Sidr and Aila affected areas (GoB, 2015e) and the need for a variety of location specific flood shelters has been identified by some groups (Rahman et al., 2015). It was found from the FGD sessions at Sidr village that, as with the char-lands of the Jamuna river basin, the socio-political system allows the opportunist groups to be entitled to such houses. Although the extreme poor, principally female headed families, were included in the scheme, it was observed that sizable numbers of poor families are excluded from these programmes.

Two years later when Aila hit the area again, CPP volunteers used a strategy to disseminate early warning and encourage people to move to shelters. However, self-motivation helped the community to respond to early warning and rescue themselves to safer places.

It was observed during the field study that CPP model was not implemented properly during Sidr. The volunteers agreed that they failed to reach every person of the community but the community did not collectively respond to early warning. Thus, although CPP is a well-structured model for community level, it nonetheless failed to understand community needs and cyclone preparedness. Local administration claimed that they informed communities regarding Sidr but communities did not whole-heartedly respond to early warning and disseminate it amongst others. However, in the case of cyclone Aila, the CPP volunteers did their work easily as they were informed how they could deliver correct messages in time to the right people and the community was also ready to respond because of its self-motivation. Both CPP volunteers and local NGO staff worked together and their activities were strictly monitored by field administration.

> "We had learnt from Sidr and acted on it before Aila. People also helped us and eventually we succeeded to move them on to cyclone shelters. We have to work hard as it is endless battle against cyclones as well as climate change." (Interviewee 19: a CPP volunteer aged 25 at Sidr village, December 2012)

> "It's true that we couldn't reach at each and every house before Sidr but it doesn't indicate the failure of CPP. In reality, CPP volunteers work hard at community level. Sometimes we don't get proper response from communities." (Interviewee 22: a government official aged 37 at Patharghata, December 2012)

The statement of the CPP volunteer indicates that cyclone preparedness is a continuous process and that the full success will not be possible without an ongoing community engagement with it. Without community involvement in cyclone preparedness and response the expected achievements are not possible. Utilising community knowledge and experience in the planning processes may also accelerate the actual goal of mainstreaming integrated DRR–CCA at the community level.

However, the government again failed to involve the community in this process later in 2013 when it was expected by both national and international experts from Bangladesh's Meteorological Department and NOAA that a severe cyclonic event would hit the Chittagong coast (USAID, 2013). The magnitude of the cyclonic event (Cyclone Mahasen) turned out to be much less than what was initially predicted. The government claimed that they evacuated 956,672 people from the coastal areas to around 3,200 cyclone shelters (GoB, 2013). A district level government official in Cox's Bazaar claimed that the government proved again the success of CPP during the cyclone (BTV, June 2013). He also added that the field administration sought assistance from the law enforcement agencies, particularly Police and Ansar[19] departments to evacuate people from their houses to cyclone shelters. The field study was completed when Mahasen occurred. However, two participants were contacted by phone to get their opinions regarding Mahasen.

CPP activities were strictly controlled by law enforcement agencies proving the government's efficiency with cyclone preparedness and response. However, this strategy ignored CPP volunteer and community opinions. There is no doubt about the success of evacuating communities to cyclone shelters by the local administration before cyclone Mahasen. If it would be a severe cyclonic event as it was predicted, costing many lives, the government would be blamed for the situation. In contrast, as the cyclone was not a severe event and the people observed little economic losses and

[19] Bangladesh Ansar and VDP was raised on 12 February 1948, to help improve the law and order situation, to act as a militia in case of national emergency and to prepare for socioeconomic reconstruction, particularly in rural Bangladesh (GoB, 2015g).

damage, communities may be misguided by the way of government intervenes with community evacuation to cyclone shelters.

> "[Upazila] administration strictly ordered us to disseminate a strong warning message and evacuate people to cyclone shelters... personally I felt the cyclone wouldn't be so strong like Sidr. However, thanks to Allah there was no casualty in my area". (Interviewee 19: the CPP volunteer at Sidr village, December 2012)

> "Everyone said that Sidr was coming back. So, I fled from my house to the cyclone shelter though it is far away from my house. Last time not only CPP people but also police came and asked us to move on to the shelter. But Sidr didn't come back this time and the next day we came back to our house. (Interviewee 7: the female Sidr survivor at Sidr village, June–July 2012)

The present research has already been showed how false early warnings misled communities to respond to cyclone Sidr. Thus, without community engagement in local level planning processes, the goals of the CPP model cannot be achieved. To implement and mainstream an integrated DRR–CCA at local level, community people need access to local level action plans. The next section focuses on why community participation is crucial to implementing national and international policies at the local level with reference to the scenario of Aila village in Satkhira district in the aftermath of cyclone Aila.

7.7 Transformation of external interventions in the aftermath of Aila

Chapter 5 and 6 discussed how globalisation influences local people's livelihoods, followed also by forced migration from coastal areas of Bangladesh to major cities including Dhaka. This politico-ecological landscape is being transformed over three decades from rice cultivation to shrimp farming. In every step of transformation, external interventions contribute to local economies whilst increasing people's vulnerability.

Once the government encouraged shrimp farming due to substantial international demands for it and new livelihood options in the production, processing and marketing of shrimp. It is found from the FGD session at Aila village that the government through its Fisheries Department motivated people to produce shrimp which is called the "white gold of Bangladesh". They also added that the government did not compensate sharecroppers and wage workers who lost their rice production

related occupations and many of them migrated to Dhaka. Apart from the government initiatives, both national and local NGOs offered microcredit for introducing small scale shrimp farming. Thus, the small farmers were interested in producing shrimp instead of rice. It was understood from the FGD session that gradually external business persons in association with local elites took control over the majority of lands of the village and water supply systems from the river. The large shrimp farm owners cut earthen embankment to make way for river water to their farmlands and unexpected erosion occurred.

Communities involves in rampant uses of natural resources leading to environmental degradation. In the southwestern region of Bangladesh, the uncontrolled usage of saline water for shrimp production not only increased salinity in their lands but also created new skin diseases. It was also found from the FGD session at Aila village that earlier both the government and NGOs failed to provide scientific information and technical assistance to shrimp farmers about how to avoid diseases.

> "Earlier we were worried about flooding and river erosion but salinity is the main hazard after introducing shrimp farming in our area. We lost rice due to shrimp and now are losing shrimp for salinity." (Interviewee 8: the small scale shrimp farmer at Aila village, July–August 2012)

> "Economic growth often destroys environment leading to put community at more risk. Community itself also involves in environmental degradation that hampers the processes of managing disaster risks, adapting to climate change and achieving sustainable development goals." (Interviewee 26: a high NGO official aged 45, Dhaka, March 2013)

However, later the government and NGOs motivated farmers in the suitable use of saline water. It is also observed that the farmers are provided with measurement kits for measuring the presence of saline water. When Aila hit the village the embankment collapsed and shrimp farms were flooded by saline water, although most external stakeholders believed and claimed that the cyclonic event was a result of climate change ignoring local realities. The concerned government department failed to maintain the embankment in timeresulting in massive destruction ofshrimp farms and other means of livelihood including poultry industry.

> "The government always needs to address all problems but one or two emerging issues are often considered seriously. For example, the government departments are primarily involved in post-Aila activities to address climate

> change impacts." (Interviewee 25: a high government official aged 50, Dhaka, March 2013)
>
> "Everyone highlights climate change in his/her sector resulting in overlooking some other localised crusial problems." (Interviewee 29: a university lecturer aged 28, Rangpur, March 2013)

It is clearly understood from the above discussion that the external interventions are always reactive in that part of the country. The national policy-makers and academics imperfectly interpreted the location of Sunderbans and the degree of its potential to protect the communities from cyclones. Cyclone Aila affected many villages located behind the forest. CPP has recently expanded its coverage area in the south-western part of the country. Transformation of the cultural landscape due to globalisation encouraged small scale rice producers to engage in shrimp farming while the embankment along the local river was fragile because of withdrawing saline water from river to shrimp farms and corruption in structural projects. However, good practices for embankment management can help secure the community from the direct and indirect impacts of future cyclonic events.

Both the government and development partners claimed that cyclone Aila was a result of climate change. This argument suppresses the actual reasons of embankment collapse such as unplanned shrimp farming and corruption in development. It is easily found from the above discussion that external interventions at Aila village rarely considered and realised the potential impact of tropical cyclones. Before Aila the government and NGO initiatives encompassed strengthening farmers' capacity for scientific shrimp production and maintaining embankment along the river protecting shrimp farms and settlements from saline water. It is observed that the government has decided to build more cyclone shelters and expand CPP activities in the area. It has already been discussed earlier that the funds allocated by the government and development partners, especially in the name of climate change are utilising cyclone preparedness and response, such as for example, construction of more embankments and shelters. However, recent interventions also fail to understand local vulnerability. Not only the government and development partners but also the media misled people by suggesting that the Aila disaster occurred as a result of climate change. The government has already implemented a rural water supply scheme ensuring safe drinking water for Aila survivors but has failed to take initiatives for removing existing saline water in shrimp farms. Table 7.9 shows how the perception of hazards

and risks has changed amongst the community and external actors in the aftermath of Aila. Six local people and four external experts working at local level (two of them from the government and the other two are from NGOs) were asked to rank their top three hazard risks with the highest potential threats towards their life and village. Before Aila both groups ranked the same hazards which hampered their life while the lists dramatically changed after Aila. The local people still consider salinity and river erosion to be the main hazards in their area but their previous third option water-logging is replaced by Aila. Conversely, climate change is ranked at the top by the external stakeholders followed by tropical cyclones and salinity.

Table 7.9 | Comparison between the lists of top three hazards at Aila village drawn from community and external actors

Phase	Community	External actors
Before Aila	Salinity	Salinity
	River bank erosion	River bank erosion
	Water-logging	Water-logging
After Aila	Salinity	Climate change
	River bank erosion	Tropical cyclones
	Aila (tropical cyclones)	Salinity

(Source: from FGD session 8 and informal discussion, fieldwork at Aila village, December 2012)

The community identified their vulnerability to hazards and risks based on their knowledge and experience while the local level practitioners selected hazards influenced by their recent activities in the DRR–CCA context. They also argued that they are motivated by recent training and workshops to conclude that Aila was a result of climate change and such cyclonic events will occur in near future. However, to understand any implementation of integrated DRR–CCA at the local level it is important to explore what local level government initiatives for climate change are actually affecting.

7.8 Summary

It is commonly accepted that disaster management initiatives in Bangladesh by both the government and development partners assist communities to reduce vulnerability

and enhance their coping capacity. The government interventions in the char-lands of the Jamuna river basin help the char-dwellers recover from disaster losses. Additionally, recent NGO initiatives aid the vulnerable groups to build disaster resilience through raising their house plinths and asset development but such a target oriented approach can put another group in a more vulnerable condition. Some well-renowned government programmes such CPP and the application of cyclone shelters rarely convince communities to cooperate in cyclone preparedness and response. This was noted from the case of Sidr, although self-motivated communities collectively responded just after two years during Aila. Cyclone Aila changed the notion of external interventions in the shrimp-culture dominated southwestern part of the country from shrimp farming development to climate change adaptation. The local practitioners, national policy-makers and experts failed to realise the actual scenario of the Aila affected area and potential future climate risks. This chapter shows that how the government climate funds prioritise of post-disaster reconstruction and redevelopment activities. The government as well as development partners may claim their successes with disaster management and climate change issues. However, this chapter further shows that without ensuring active participation of communities in local level action planning, the aim of implementation and mainstreaming an integrated DRR–CCA at local level will not be possible.

Chapter Eight

Climate change adaptation through disaster risk reduction: Implications and outcomes at community level

CHAPTER EIGHT

Climate change adaptation through disaster risk reduction: Implications and outcomes at community level

8.1 Introduction

This thesis has critically examined the implementation of integrated DRR and CCA at local level in rural Bangladesh, refining the potential of DRR approaches as adaptation strategies for future climate risks. Three research objectives have been addressed being sequentially analysed and described in the previous three empirical chapters (Chapter 5-7). Chapter 5 has revisited the social vulnerability of communities in changing environments. The chapter also discussed how interventions at different spatial and temporal scales influence multiple environmental, political, economic and social dimensions of localised vulnerability. The scale of analysis can be both vertical (global, national, local and community) and horizontal (for example, across river basins and coastal regions) with temporal aspects relating to either climatic change over years or seasonal variations within a year. Chapter 6 has analysed the changing trends of community knowledge and practice in terms of coping with environmental disasters and adapting to climate change. The coping strategies and mechanisms vary in terms of frequency and magnitude of extreme events. It was found from the fieldwork that the flood survivors have more adaptive capacity compared to the cyclone survivors. Chapter 7 explored the transformation of the cultural landscape through external interventions. Though the government and NGOs often claim that most of their programmes and projects implemented at local level incorporate "community-based" approaches, practically these programmes and projects do not ensure community participation. Further their interventions can become inadequate and complex in some circumstances, particularly in terms of social class and gender perspectives. Overall, socio-political factors have been considered the main obstacles to community engagement in local level intervention.

The present chapter reviews these empirical findings alongside the wider questions and thoughts raised in relation to implementing an integrated DRR–CCA at local level in Bangladesh. The discussion is guided by the principles expressed in the concept of DRR as an adaptation strategy for climate change. The chapter especially concentrates on the implications for community-based DRR for community people, the local level

development practitioners, and the national and international institutional framework for managing disaster and climate risks in Bangladesh. At household and community level, this includes diversified outcomes such as differing perceptions of climate change, living with environmental hazards, preserving degrees of dignity, coping with external intervention, and the implications across social class and gender dimensions. It is suggested that coordination between local level actors and strengthening local institutional frameworks can increase the potential of implementation of an integrated DRR–CCA at local level. As with the local level, the (central) government also needs to reinforce a comprehensive policy and institutional framework for mainstreaming and integrating DRR and CCA that can be accelerated through strengthening the cooperation between the government and NGOs. The chapter argues that differing understandings of climate change impacts at all scales (from global to community) can threaten DRR implementation. In contrast, DRR approaches in Bangladesh can be executed as an adaptation strategy for future climate risks although some limitations of implementing DRR have been observed. However, it was understood from the fieldwork that coordination between development partners in terms of formulating a common plan of action for local level implementation and sharing financial and technical contributions can assist to reduce the likelihood of overlapping strategic objectives and activities. Community engagement in local level external intervention is the key issue for integrating CCA initiatives into DRR approaches. The challenges and opportunities for community engagement in local level intervention, and how this can increase its potential application in promoting resilience to climate induced disasters, are also analysed and showed. A brief summary of these topics is provided before the following chapter provides a number of conclusions on the main arguments made in the thesis detailing the wider implications of this study.

8.2 Conceptual challenges of integrating DRR and CCA at local level

Prior to verifying the lessons that can be learnt from examining DRR as an adaptation strategy for climate change in rural Bangladesh, the conceptual challenges of integrating DRR and CCA at local level are addressed. This is to make the concept more valid to the context of Bangladesh as illustrated in the previous chapters. The thesis has critically analysed multiple dimensional social vulnerability to environmental hazards and diversified adaptive capacity of an individual household and a community collectively for coping with disasters within a resource poor

environment. This enabled a reconsideration of how external interventions assist community in these circumstances. New understandings of the importance of DRR as an adaptation strategy and for community engagement in local level interventions also indicate the challenges and opportunities of integrating DRR and CCA at local level in Bangladesh context.

Integration of DRR and CCA in practice is an emerging issue in both disciplines. The arguments of integration between DRR and CCA and mainstreaming them in wider development processes is founded on the potential double impact of climate change on human ecology and increased frequency and magnitude of environmental hazards in contexts of social vulnerability (O'Brien et al., 2008; Davies et al., 2009; UNISDR, 2009a; IPCC, 2012, 2014). In addition, despite some differences, the literature identifies a range of conversing agendas of both DRR and CCA in terms of policy formulation and implementation that supports integration (O'Brien et al., 2006; Thomalla et al., 2006; Schipper and Pelling, 2006; IPCC, 2012). Influenced by this basic alignment, UNISDR and UNFCCC, the major two institutional frameworks at international level dealing with DRR and CCA respectively, consider the idea of mainstreaming an integrated DRR–CCA at all levels (IPCC, 2012, 2014; UNISDR, 2014; United Nations, 2015). At national level, in the context of Bangladesh, the government and development partners have already incorporated the concept of integration of DRR and CCA in implementing their regular functions and various development programmes and projects (CCC/GoB, 2014). However, differing perspectives from the participants of the study on coping and adaptation strategies and mechanisms for reducing disaster and climate risks are grounded in subjective perceptions of interconnected multiple realities. In Chapter 4 epistemological arguments were drawn as to how the empirical data has components of subjectivity. In respect of answering the research questions of the study, subjective perspectives were engaged in the prevailing understanding of social vulnerability and community capacity to cope with environmental hazards and adaptation to future climate risks with or without external assistance.

From both the literature review and field data it can be argued that integrating DRR and CCA at local level depends not only on how international and national policies and activities are executed at local level but also on how people and communities respond to and engage in these external interventions. International and national initiatives for managing global environmental risks have often overlooked the multi-

dimensional ways in which risks are experienced at community level, depending on the contextual nature of risks, and the factors that make people vulnerable to environmental hazards and disasters (Blakie et al., 1994; Wynne, 1994, 1996; Sen, 1999; Bassett and Zeuli, 2000; Wisner et al., 2004). International and national policies rarely reflect the knowledge and experience of the vulnerable people, particularly women, and that these policies may not be suitable for reducing localised vulnerability (ibid.). Wynne (1994) argues that the scientific language of "experts" determines the policy implementation guide (for example, the roles of externals), that suppresses localised "lay" people's opinions and often creates mistrust between communities and externals and ultimately leads towards the failure of policy-making and implementation processes. In Chapter 2 has already discussed why community engagement is important in local level decision-making processes to not only explore local knowledge, experiences and practices, but also understand socio-cultural realities. However, the DRR and CCA conundrum of implementing international and national policies at local level has differential implications for communities and other actors across scales and sectors, discussed in the following sections of this chapter.

8.3 Implications for communities

In the context of climate change, developing DRR strategies needs new approaches that should be decided after consulting with people of concern and communities (IPCC, 2012, 2014). Apart from local limitations, communities have diversified adaptive capacity to cope with environmental hazards that may enhance community resilience and in anticipating and responding to localised future climatic risks. From a community-based adaptation perspective, Ayers and Forsyth (2009) argue that these strategies ensure active community participation for identifying and implementing community-based development activities through participatory techniques (for example, PRA tools) that can enhance local people's adaptive capacity. The present study indicated benefits from implementing DRR approaches as an adaptation strategy in a community vulnerability and capacity context. It showed why and how community engagement in local intervention is beneficial for the implementation of integrated DRR–CCA at local level.

8.3.1 Community perceptions about climate change

Social perceptions of risk that influence human behaviour and attitude can be explored from different perspectives, including history, geography, sociology, political science and psychology (UNESCO, 2014). The present study focused on how communities perceive and interpret their localised risks in a changing environment (Chapter 5). It is understood from the fieldwork that the communities in Jamuna river basin interpret the risks of climate change through how they have observed and experienced natural hazards in their day-to-day life as disaster events. The perceptions of risk often differ between individuals and groups in both space and time, and these perceptions also relate to their sense of 'certainty' (Ayers, 2010). The projected impacts of future climatic risks relate to 'uncertainty' and here the range of uncertainty is too wide to determine the appropriate means of adaptation (IPCC, 2012). The research finds that the impacts of environmental disasters on the char-dwellers, particularly the vulnerable people were severe, but with a high level of certainty around the risk factors that make them more vulnerable to a range of uncertain future climatic risks (Ayers, 2010). However, local perceptions are not always based on how local people perceive and experience, rather how their perceptions embed the knowledge of external actors. For example, the Sidr and Aila affected coastal communities and local level development practitioners in those areas believe the recent cyclonic events occurred due to climate change, and this understanding was based on the information transferred through international and national level policy implementation systems. As a result, concerned communities and external actors failed to identify other risk factors, such as corruption, embankment collapse, cultural practice and so forth, which have a direct connection with why they are more exposed to recent cyclonic events.

8.3.2 Living with environmental hazards and seasonality

A high proportion of Bangladeshi citizens live in low-lying river basins and regularly the lands are inundated by recurrent floods. Indeed "living with floods" is a part of their day-to-day life. Normal flooding carries an extensive amount of soil nutrients into natural levees in relation to which communities adjust their agriculture-based livelihoods in rural Bangladesh on a regular basis, although they must experience the severe flood events (Brammer, 1999, 2004). High soil fertility is not the only reason why the char-dwellers live in one of the most disastrous areas in the world. Some other social factors such as population pressure, ownership of land and access to

natural resources influence them to stay in such a potentially hazardous environment (ibid.). However, the ownership of assets (e.g. land) and access to natural resources, and local services and institutions are highly class structured. Local elites often control the lion's share of natural resources and have more access to locally available services.

Figure 8.1 illustrates the well-off part of Bonna village with a typical agricultural landscape that is available in the other parts of rural Bangladesh. The photograph also shows the farmers have recently sown a late variety of rice in the front plots whereas an early variety of rice is almost ready to harvest in the rear of those plots. This cropping pattern helps the well-off farmers to cope with an adverse situation, particularly severe floods and ensures year-round livelihood options for the extremely poor households of the char-land (e.g. wage workers). It is also observed that the houses in the photograph are surrounded by a variety of trees including vegetables, fruits and timbers, that such practice is not only ecologically viable but also a vital strategy for food security. In contrast, as the vulnerable groups have comparatively less access to natural resources and social services the livelihood strategies of the vulnerable groups are more complex. Chapter 6 analysed the diversified livelihood strategies and options of the char-dwellers including vulnerable groups to cope with environmental disasters. The study revealed three major livelihood strategies of the char-dwellers in Jamuna river basin: agricultural intensification, livelihood diversification and seasonal migration, which have already been indicated in the 'rural livelihood framework' of earlier years (Chambers and Conway, 1991).

Figure 8.1 | Eco-friendly human habitats at Bonna village

(Source: Author)

Figure 8.2 | The edge of the char-land in dry season

(Source: Author)

The primary objectives of the Flood Action Plan (FAP) to protect the country from severe floods (Brammer, 2010), was criticised for failing to understand the nexus of flooding and agriculture, as flagged through the concept of "living with floods" by national level academics and professionals (Schmuck-Widmann, 1996; Ahmed, 1999; Brammer, 2004). The literature shows most hazard and disaster studies in Bangladesh have primarily focused on people's impact-based vulnerability and coping mechanisms with empirical evidence (Rahman, 1991; Baqee, 1998; Khan, 1998; Brammer, 2004; Biswas 2005; Ahmed, 2006). Due to concentrating on flood studies, the academic world paid minimal attention to the impacts of seasonality. Few studies analysed why and how seasonal variation is a matter for the char-dwellers' life, particularly in food security and sustainable livelihood context although some notable exceptions where Chambers (1982), Brammer (2000) and Devereux et al. (2008). Though severe floods have adverse impacts on their life in a food security and livelihood context, floods, particularly normal floods offer easy communication to towns and growth centres of the mainlands. The char-dwellers easily move from one place to another by boats. It is understood from FGDs at Bonna village that the char-dwellers usually use a *Dingi* (dinghy) for travelling inside the char-land and board large engine boats to the mainland. During the dry season (November–March) they have to walk 2-4 kilometres on sand as the low-lying sandbars appear when the level of river water goes down and the local jetties are shifted away. Figure 8.2 illustrates the temporary movements from the Char showing the main walking path on sand to the jetty to the western side of the mainland during the dry season. The people in the photograph belonged to differing age groups and were going to the mainland including the district town either to get access to services which are not available in their char or to sell their agricultural products in mainland market places for a higher value. Two of the children in the photograph were going to secondary school as there is no secondary school in the char and the third child, carrying a bunch of vegetables on his head, was going with his father to assist him to sell their products.

In this research 'severe floods' are considered as a subject of 'uncertainty' whereas seasonality and normal flooding mean dealing with 'certain' factors. Again going back the question raised earlier why the char-dwellers want to live with 'uncertainty'; the answer is not simple. The abovementioned social factors (e.g. ownership of land and access to natural resources) are undoubtedly important in their life but some environmental factors such as seasonal variation and normal flooding play vital roles

to keep them in the char-lands. Chapter 5 critically analysed and illustrated how seasonality impacts on the char-dwellers' lifestyle in terms of cropping pattern and agriculture-based diversified livelihood options and seasonal variation of their scarcity and vulnerability. Further Chapter 7 explored how a number of government and nongovernmental activities and programmes are implemented depending on seasonal variation. Specific government projects (e.g. Food for Work) are often implemented during lean periods for offering localised livelihood opportunities for the char-dwellers, particularly for the vulnerable groups. This supports the need for acknowledging and respecting community engagement that straddles the rapid and slower onset crisis response in these areas.

8.3.3 Coping and adapting from a local community perspective

Chapter 2 critically examined coping and adapting in the DRR and CCA contexts. IPCC (2012) defines 'coping' as a way of responding to an experienced impact usually for a shorter period. In hazard and disaster studies perspectives, coping strategies and reactions of people and communities are usually related to shorter term affects of extreme environmental events and how communities, particularly disaster survivors coped with them (Brammer, 2000; Wisner et al., 2004). In contrast, 'adapting' refers to a process of adjustments to existing and expected or predicted changes over longer time (IPCC, 2012). Originating from the natural sciences, the term 'cultural adaption' was first used in the discipline of social sciences by the anthropologist Julian Steward to describe how communities adjust to the natural environment (Smit and Wandel, 2006). Further Butzer (1980) is one of the first academics using the term 'adaptation' in the context of climate change. IPCC acknowledged adaptation as an alternative strategy of 'mitigation' for adjusting to the existing and expected climatic changes associated with global warming (IPCC, 1995, 2007, 2012, 2014). Before the current move to integrate DRR and CCA, hazard and disaster studies concentrated on vulnerability to environmental hazards and how individuals, households or communities cope with disasters. Over the last two decades, climate change became a new dimension of hazard and disaster studies and recent research focuses on how an individual household or a community collectively can adapt to predicted future climate-induced disasters (IPCC, 2012). However, some studies claimed that the wider concept of adaptation is not new at all as communities

have in any event always been adapting to environmental changes over many millenniums (Butzer, 1980; Prabhakar and Shaw, 2008).

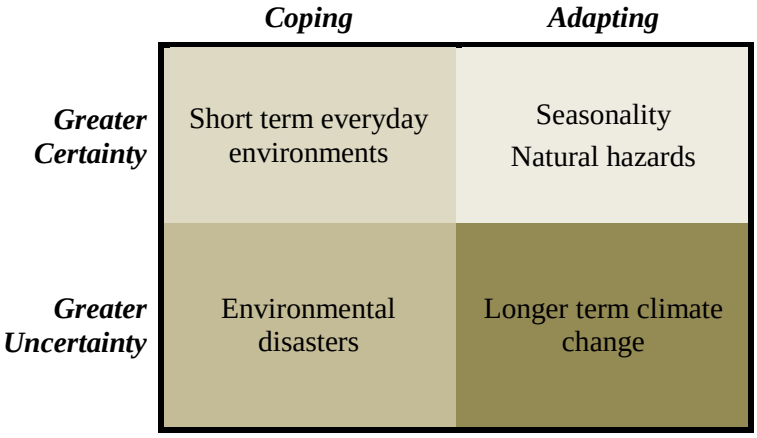


Figure 8.3 | Understanding environmental uncertainty in terms of local level coping and adapting

(Source: Author)

The present study revealed that the char-dwellers of Jamuna river basin adapt to some certain environmental changes and variations that enhance their capability to cope with uncertainties (e.g. severe floods) (Figure 8.3). In contrast, adaptation strategies to climate change are new to communities and these strategies predominantly depend on predicted future climatic uncertainties (IPCC, 2012). These circumstances indicate that people and communities, who are able to adapt to certain seasonal variation, will need to increasingly adapt to uncertain changes. Enhancing contextual DRR approaches through integrating DRR–CCA at the local level may help them to adapt to future climatic risks.

8.3.4 Preservation of dignity

In the socio-cultural context, the preservation of dignity is a vital component at community level. It was observed from the fieldwork that individual households and communities are collectively concerned to preserve their dignity, particularly in relation to food and livelihood security. The present study considered ‘dignity’ to be a positionality of individuals or communities of different social class and gender within a resource poor environment on the basis of two distinct theoretical constructions.

Firstly, the preservation of dignity is viewed as fundamental to the construction of entitlements and ownership. Sen (1982) argues how starvation relates to food supply in terms of entitlement systems and the structure of ownership and why and how this applies to poverty in general and to disasters (e.g. famines) in particular. Considering ownership as a kind of entitlement, he states that "an entitlement relation applied to ownership connects one set of ownerships to another through certain rules of legitimacy" (ibid: 1). Apart from some criticisms, the analysis of food entitlements decline (FED) by Sen (1982) was certainly a great advance on theories of food availability decline (FAD) (Wisner et al., 2004). The present study revealed the relationships between ownership of land and livelihood-based entitlements, and how it relates to individual and communal dignity. It is understood from the fieldwork that, after introducing shrimp-culture at Aila village, it was not a matter of unavailability of localised employment but of people's unwillingness to work in shrimp farms. The understanding of why the wage workers, who primarily belong to extremely poor households, refused to work in shrimp farms directly relates to their dignity. Primarily small rice farmers and sharecroppers were also not interested in adopting this new practice. Chapter 7 critically analysed how external inventions in association with local elites pursued them to convert their livelihoods. The study also found that the ownership of land and common properties of the char-dwellers in Jamuna river basin related to community dignity as a whole. Previously chapter 6 also showed how the char-dwellers cope with environmental disasters through their diversified predominantly natural resource-based livelihoods.

Secondly, the preservation of dignity is also considered as the core element underpinning cultural realities and empowerment in a poverty reduction context (Ahmed, 2008). Ahmed also argues that spirituality as a cultural reality can enhance women's empowerment within a conservative society. The present study considered cultural realities and empowerment as not narrowing the concept of dignity on spiritual grounds, but expanding it to wider socio-cultural realities. It was observed from the fieldwork that the poor households maintain dignity in their daily life, although they are often marginalised by society. Further the char-lands of Jamuna river basin are not only geographically but also culturally detached from the mainland. It was observed from the fieldwork that the char-dwellers who migrated and settled in the mainlands are often addressed as *Choira* (a char-dweller) or *Nodi Vanga Manush* (a people displaced by river erosion). The first term is a kind of slang word in oral

Bangla, often used for the char-dwellers with an indication that they are not civilised enough to live on the mainlands, particularly in urban environments, whereas the latter term is used in a sympathetic way to identify that the people lost their homes and assets to rivers. Many extremely poor households thus want to live inside the char-lands with the uncertainties they find there. They adapt to seasonality round the year within a resource poor environment without getting any external aid enhancing feelings of dignity. However, they need external assistance for coping with extreme events and they claim that they are entitled to receive relief as they practically do not have jobs inside the char-lands during lean periods. From a gendered perspective, women rarely go outside the char-lands, particularly in searching for jobs and the community collectively feels that this way they can preserve their dignity. Despite the cultural realities, women of Bonna village are involved in diversified wage works and NGO activities inside the char-land that helps them to be empowered. It was also observed that many girls are going to schools within a conservative environment and their parents also allow them to do so in relation to an intention that their girls be educated and empowered enough to help them in their old age (Caldwell et al., 1998).

Thus, the preservation of dignity is a vital concern in people's daily life in rural Bangladesh. If follows from this study that it is necessary to understand how people individually and collectively maintain their dignities within a community, that this relates to living with uncertainty and that this influences how they respond to externally driven activities.

8.3.5 Response to external intervention

It has been discussed several times in the thesis, particularly in chapter 6 that people and communities utilise their capacity to adapt to seasonal variation and cope with environmental disasters, and that this may enhance their adaptive capacity for climate change. Further external assistance helps them to cope with adverse events as described in Chapter 7. Though the paradigm of disaster management has shifted from a traditional 'relief and response' approach to a holistic disaster management approach (Blaikie et al., 1994; Hewitt, 1997; Wisner et al., 2004; Coppola, 2006; UNISDR, 2009a), relief still makes a positive contribution to recovery from immediate disaster losses and damage. It was observed from the fieldwork that the char-dwellers of Jamuna river basin mostly depend on relief during severe floods and post-disaster activities. They are also involved in different reconstruction activities (e.g. earth

digging) through the government's social safety net programmes. As the local governments control the selection procedures, the char-dwellers, particularly the members of extremely poor households, often pursue the local elites to get their names included in those development activities.

The paradigm shift in disaster management has also contributed to change in local level external interventions. It was observed at Bonna village and the surrounding villages on the char-land that the development partners in association with their local partner NGOs have implemented new DRR approaches to improve community adaptive capacity to cope with environmental disasters. Chapter 7 demonstrated how raising house plinths and asset transfer (e.g. livestock) are the two major approaches that assisted the beneficiaries of those development programmes. In contrast, the char-dwellers maintain a close tie with local elites and NGO personnel as suggested in the following quote from an NGO worker and a housewife at Bonna village.

> "We try our best to help people. We know the reality of the chars; probably everyone needs help. But we can't do it as project activities are run according to the decisions of the higher authority and the donors. We tried our best to select the appropriate persons for every project but sometimes local people don't cooperate with us. For example, after starting the big project funded by ... [the name of an INGO] at Bonna village, we faced great problems to select the actual households who supposed to be included. I forgot the exact figure but the number of households of the village dramatically increased by 20-30 percent. Personally I knew one extended family belong to vulnerable group and the old couples lived with their two married sons' families in the same house. But when I visited the village to select the vulnerable families as the beneficiaries of the project, I saw the family was divided into three separated nuclear families." (Interviewee 17: the NGO worker at Bonna village, March–May 2012)

> "Yes, we lived with my parents-in-law in the same house. Now we live in separate house. Both I and my mother-in-law were included in the project but my sister-in-law was excluded. They are really extremely poor; they must be included but the NGO people rejected her as they had already selected me and my mother-in-law. (Interviewee 2: the housewife at Bonna village, March–May 2012)

The above NGO staff stated his own experience of how he saw extended families were segregated as nuclear families. During the fieldwork not a single extended family was found. This is a strategy of the vulnerable groups of the char-lands to cope with new DRR approaches. It is understood from the comments of the housewife that the external intervention is why her extended family was divided into three small

families. Previously it had been discussed that recent development activities target the most vulnerable groups of the char-lands driven by the concept of “the poorest of the poor”. This target-oriented approach rather than being a ‘whole-of-society’ approach for development programmes in the Jamuna river basin influences communities to break up their social harmony in general and family bonding in particular.

Some external interventions have more direct impact on their livelihoods. Chapter 5 and 7 already showed that how the government and local NGOs encouraged the local rice farmers to do shrimp production. In the initial phase, the government and the NGOs provided inputs of shrimp farming free of cost. Thus, the small farmers and sharecroppers were also forced by the large land owners to either sell or lease their lands to them. Similar to processes in the shrimp producing areas, development partners and later the government motivated the char-dwellers of Jamuna river basin to cultivate maize. The government and the local NGOs trained the farmers to produce maize as a cash crop and supplied agricultural inputs such as maize seed, fertilizer and pesticide. The major development programmes strongly influenced their beneficiaries to produce maize in their lands. It was observed from the fieldwork that a sizable number of farmers produced maize for several years but then they lost interest. The external actors paid more attention to production rather than marketing. The farmers hardly sold their crops due to poor communications. The producers of poultry and fishery feeds then took the opportunity to buy excess maize from the poor char-dwellers at a minimal price.

However, the local people often assist in improving the activities of external actors through their knowledge and experience. Their actions in raising house plinths are a suitable example. Although it is not clear how the concept developed in the Jamuna river basin. The char-dwellers claimed that it was their idea to protect themselves from severe floods through raising house plinths and they transferred this knowledge to local NGO staff. In contrast, the local NGOs argued that they adopted the idea from the char-lands but had adapted it differently. Before implementing this DRR approach, the well-off families of the char-lands in Jamuna river basin raised their house plinths above the flood of 1988 but the number of such houses doing this was few. The local NGOs then consolidated and communicated the idea and convinced the INGOs and the donors to implement this approach in case of vulnerable groups. Regardless of how it emerged, the approach of raising house plinths has changed the vulnerability scenarios of the char-lands. The char-dwellers continue to contribute to improving the

design and structure of a house plinth. At the primary stage, the structure and basement of a house plinth was enough to accumulate the main house along with the cow shed, toilets and tube-well platform. Later the communities suggested redesigning the structure to increase the size of a house complex. Thus, a further example is provided as to why community inclusion is vital for implementing external interventions. Further community knowledge and experience is necessary to improve integration of CCA into local level DRR initiatives.

8.4 Implications for local level actors

Local level development practitioners work as the media between communities and national and international level actors. The local level actors include the representatives of local governments and the staff members working for the government and NGOs at local level. They play vital roles to implement development activities including DRR approaches and may influence implementation of an integrated DRR–CCA at local level. The relationships of the local level actors with communities and national level actors are complex and vary depending on how they are able to utilise their knowledge and experience between these different spaces of interaction.

8.4.1 Coordination between actors at local level

Local government is supposed to be the main actor at local level for maintaining all development activities. In rural Bangladesh, a Union Parishad (UP), the lowest tier of the local government system of the country, is involved in its regular activities as well as implementing development programmes of the national government. The chairman and the members of a UP are elected by the people of the concerned administrative territory and usually live within the area. Therefore, they are also the local people and can understand localised vulnerability and communities' adaptive capacity to environmental disasters. Though they are involved in the development processes of the national government, they have minimal access to the decision-making processes that have already been discussed in Chapter 7. In contrast, an Upazila Parishad (UzP) has more legislative power compared to UP to make any local decisions for public interests although an UzP has comparatively less direct contact to local people. Figure 8.4 illustrates the coordination network between the actors operating at the local level.

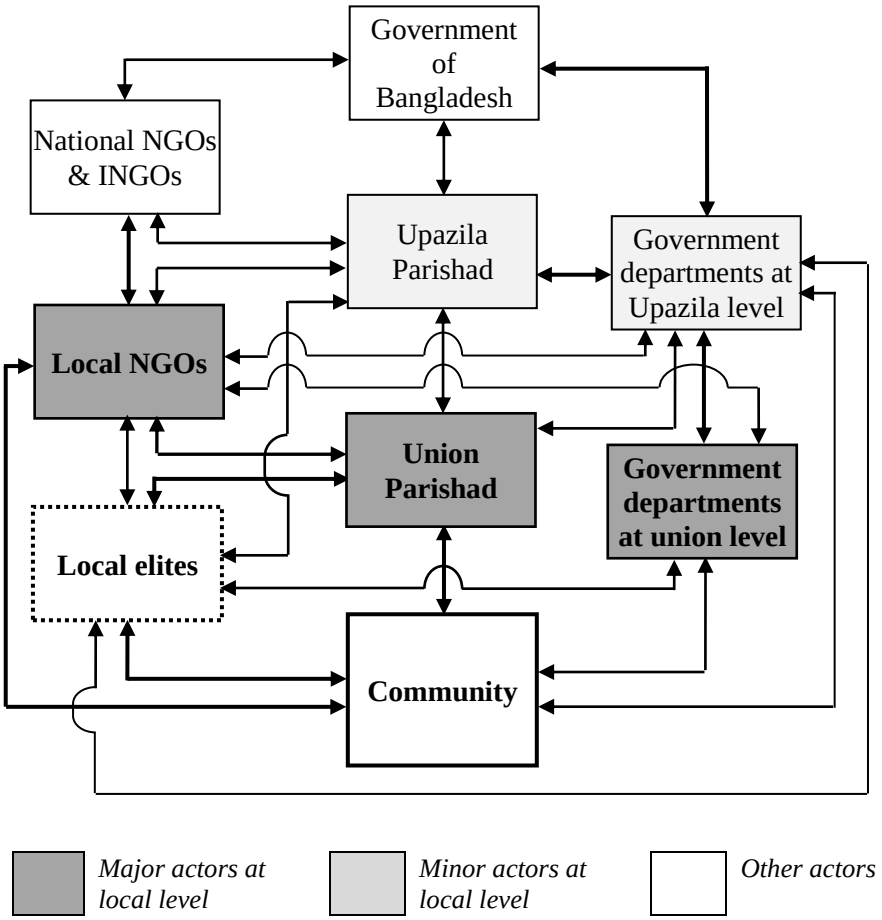


Figure 8.4 | Coordination network between the local level actors, communities and other external actors

(Source: Author)

The government departments at union level are supposed to be vital actors in implementing the (national) government policies and action plans. There are only four government departments who have their offices at union level: health, agriculture, social services and land administration. The health and land offices work directly under the relevant offices at Upazila level. UP can directly supervise the activities of agricultural and social services. Other government departments conduct their activities at village and union level directly from the relevant offices at Upazila level. Though the union council may monitor all government activities at union level, it was observed from the fieldwork that union councils can rarely do it. The union chairmen often need to seek assistance form Upazila Chairmen to solve any problems occurring between them and government departments. The government departments run their functions according to the central government rules and regulations. The following government official statement reports that highly bureaucratic systems of Bangladesh

do not give enough space to government officers working at field level. This means they do not utilise their own merits to minimise any local demands. His statement also indicates the existence of the poor coordination between the local government and the government departments working at local level.

> "I worked at Upazila level for five years. It is difficult to manage every person. Though we are public servants, we are working under the bureaucratic system of the central government. We are advised in our foundation training that being a government officer we should use our own merits to solve any problem. But unfortunately we have to implement the [central] government decisions in terms of how we are ordered and guided by our higher authority. Besides, we also need to manage local government representatives and other local elites. We try our best to coordinate and cooperative with all. Yes, sometimes we feel local needs and demands differing from the government decisions but we can't go against the government policies and guidelines." (Interviewee 24: a mid-level government officer aged 40, who worked at Upazila level, Dhaka, March, 2013)

Local NGOs also provide important roles in local level development processes, although they mainly implement the programmes of national NGOs, INGOs and donors. It was observed from the fieldwork that most local NGOs have their own functions, particularly microfinance activities. Thus, the local NGOs have very close relationships with communities. It was also observed that the local governments hardly know about NGO activities. However, INGOs involved union councils in their activities through big development programmes (e.g. RBP, CLP and SHOUHARDO). The local governments assist the local NGOs to select villages and beneficiaries. Further the government can monitor all NGO functions and advise them to adjust to national policy and implementation plans. On behalf of the (central) government, the Deputy Commissioner (DC) and the Upazila Nirbahi Officer (UNO) monitor and supervise all NGO activities in their concerned district and Upazila, respectively. At union level, the chairman of a union council can monitor the NGO functions within his or her territory.

> "The field administration of the [central] government regularly monitors our activities and can also suggest modifying our programmes at local level. But we the local NGOs hardly get the chance to give our feedback on government development activities. In fact, we have to readjust our activities depending on government policies and development plans." (Interviewee 27: the executive director of a national NGO, Sirajgonj, February, 2013)

The above NGO personnel states that local NGOs have minimal opportunity to contribute to national development policy formulation and action plans. It was observed throughout the fieldwork that both the government and NGO officials at local level often criticise each other. NGO officials indicated that the government often targets the lean periods of a year for delivering their services and resources, and their activities are absent for the rest of the year. As such, communities treat the government as an outsider although the government works throughout the year living within communities and the local people, particularly vulnerable groups, are involved in their activities. In contrast, the government officials criticised NGOs' failure to contribute to poverty reduction. The activities of microcredit programmes are not successful and in many cases credit recipients do not get free from the vicious cyclone of debt and poverty. Apart from some limitations, the government officials claimed that they are more liable to provide services to communities by law. However, these conventional development approaches such as 'trickle-down' and 'targeted group' cannot eradicate poverty in general and reduce disaster vulnerability in particular in the long run and raise related issues of power and justice (Sobhan, 1999). Implementing DRR–CCA at local level will therefore necessarily depend on how the local level actors are interconnected through an improved coordination and cooperation system.

8.4.2 Strengthening local level institutional setting for implementing an integrated DRR–CCA: Challenges and opportunities

Chapter 3 described the different tiers of the local government system and their responsibilities for disaster management. According to the Standing Orders on Disasters (SOD) of the government, there is a committee at each tier of the local government system. In urban Bangladesh, the elected mayors of city corporations and Paurashavas (municipalities) chair the respective disaster management committees. At district and Upazila level, the DC and the UNO chair the District Disaster Management Committee (DDMC) and the Upazila Disaster Management Committee (UzDMC) of the concerned administrative territories respectively. There is a Zila Parishad (district council) in every district and this is the highest tier of the local government of Bangladesh. The chairman of the council is selected by the government, although he or she should be elected by the concerned members by law. It was observed from the fieldwork that the activities of the district council are minimally visible at local level. DC, a mid-level government official and the

coordinator of the (central) government at district level, has more administrative influence on different government departments both at the district and Upazila level. In contrast, at Upazila level, an Upazila council has its own elected chairman and two vice chairpersons (one of them is female). According to SOD, UNO, a junior level government official working as a coordinator at Upazila level on behalf of the (central) government, chairs the UzDMC. However, at union level, the UP chairman chairs the Union Disaster Management Committee (UDMC). Table 8.1 shows the representation of different types of members in the local level disaster management (DM) committees. The government officials are overwhelmed at district and Upazila DM committees whereas the local government elected representatives are the majority at union DM committees. The representation from NGOs is insignificant at all local level DM committees. The table illustrates that the local level DM committees are strictly controlled through a top-down approach, although the government claims that its disaster management system follows a bottom-up approach.

Table 8.1 | Distribution of the members of local level DM committees of the three study areas

DM committees	Govt officials	LG represent-tatives	NGO personnel	Others	Total
DDMC	32-34[a]	2	4	8	46-48
UzDMC	18-19[b]	7-11[c]	4	8	37-42
UDMC	8-9[b]	13	4	10	35-36

Note: The numbers of members are varied in terms of the numbers of Upazilas/ unions in the administrative units. The Table is only representative of the districts/ Upazilas/ unions used in this study.

[a] The number varies depending on the number of Upazilas in the concerned districts such as Sirajgonj, Barguna and Satkhira, as the UNOs are the members of the respective DDMCs.

[b] The number varies due to the inclusion of CPP representatives in the committees at coastal areas.

[c] The number varies depending on the number of unions in the concerned Upazilas such as Chauhali, Patharghata and Ashashuni, as the concerned UP Chairmen are the members of UzDMCs.

(Source: Author developed from fieldwork in Bangladesh, December 2012 – March 2013)

SOD allocates responsibilities. These responsibilities are divided into two broad themes of DRR: risk reduction and emergency response. Emergency response is divided into pre-, during and post-disaster activities. Table 8.2 shows the number of responsibilities of the main actors at local level according to the SOD. Though all

actors are responsible for almost the same activities within their jurisdictions, it maintains a systematic hierarchy to disseminate the government orders and responsibilities. It was understood from the fieldwork that the concerned persons at all levels agreed that SOD has a vast field of responsibility.

Table 8.2 | Number of responsibilities of Upazila level government official, local government elected representatives and NGOs

Stages	UNO	UP Chairman	UP Members	NGOs
Risk reduction	8	9	5	4
Emergency response				
Normal times	18	17	3	8
Alert and warning stage	11	9	6	16
Disaster stage	11	11	1	7
Rehabilitation stage	14	11	1	5
General instructions			13	
Total	**62**	**57**	**29**	**40**

(Source: Author collected from SOD, 2010)

This is also exemplified in the following quote:

> "You are just talking about the duties on disasters (SOD). In every sector the (central) government sanctions a long list of our duties and sends us the lists. If someone knows the responsibilities driven from the government, he or she won't stand for the election... we have no specific funds for conducting disaster management related training and workshops. In emergency, we don't get time to read what the SOD says. We just use our own merits and consult with the chairman and try to do what he says." (Interviewee 16: the female member of the Union Council, Aila village, March–May 2012)

The above UP elected female member indicated that the local governments are involved in disaster response. In fact, it was observed many local representatives have also been affected by recent extreme events. The local actors claimed that SOD is a good guideline for how they should work to reduce disaster risks and to respond to disasters in emergencies. However, they added that SOD does not mention about the financial mechanisms for implementing and demonstrating the activities. The local governments, particularly union council has no specific funds for training and workshops.

The government implements its DRR policies and functions at local level through the Department of Disaster Management (DDM). There is a DDM office at every Upazila in Bangladesh. Chapter 7 has already illustrated that how the activities of DDM mainly focus on delivering resources and creating livelihood opportunities in lean periods, particularly for the vulnerable groups. It was observed that DDM hardly organises any training and workshops on disaster management at local level. In contrast, the presence of NGOs is significant in awareness building programmes. For example, one of the main strategic objectives of the USAID funded SHOUHARDO programme is enhancement of the capacity of the members of DM committees at local level.

In the case of climate change, there is no institutional set-up at local level in Bangladesh. The local level development practitioners, particularly in the field of disaster management are informed about climate change and its negative impacts on environmental and human systems. The present study found that in some cases the information may mislead people in their understanding and identification of localised vulnerability and risk factors. It was observed that the local level development practitioners believe that climate change solely occurred in the form of cyclones Sidr and Aila which misguided them away from understanding other vital factors. However, the local level practitioners appear to variously indicate the tendency of present and recent interventions of national and local governments, NGOs and other development partners to address 'adaptation' based on what they can extract from local people's existing 'disaster management' experiences. This is despite local perceptions of adaptation being unclear and as yet not managing to bridge a gap between international and national level adaptation policy, and local level vulnerability. This also shows that without being grounded in local knowledge and practices, it would be difficult to implement a truly integrated DRR–CCA at the local level.

8.5 Implications for national policy and institutional framework

The Government of Bangladesh plays the central role in formulating development policies and implementing them through its regular functions of 61 ministries and 351 departments, various programmes and projects (GoB, 2015d). In relation to disaster management, the government mission is to bring a paradigm shift from conventional

relief and response practice to a wider comprehensive risk reduction culture (GoB, 2008). Chapter 7 has critically analysed in detail the chronological development of disaster management policy and institutional frameworks. It has also already been mentioned in this thesis that the Ministry of Disaster Management and Relief (MoDMR) and the Department of Disaster Management (DDM) are the respective ministry and department to deal with disaster management related issues to the national government. Chapters 3 and 7 have demonstrated that the major activities of MoDMR and DDM. It was observed from the fieldwork that the officers of DDM at upazila and district level are with predominantly civil engineering backgrounds and they utilise their engineering knowledge to solve an array of problems. Further their activities are strictly monitored and supervised by the UNOs and DCs in the respective administrative territories. In addition, the local government representatives, particularly at union level pursue project activities in their area as much as they can, but this is often without considering local needs and demands. In these circumstances DDM activities pay less attention to communities. CPP disseminates cyclone early warnings to the community level. In contrast, the Ministry of Environment and Forests (MoEF) and the Department of Environment (DoE) are the ministry and agency to formulate policies and programmes for climate change. There is a trusty body to deal with climate change issues, the Bangladesh Climate Change Trust (BCCT) under the same ministry and that the main financial mechanism is through BCCTF. Different government ministries and departments, NGOs and research organisations conduct applied research in both mitigation and adaptation strategies.

Though recently the government ratified the Disaster Management Act 2012 and prepared the final draft of the National Disaster Management Policy 2014, historically the government formulated several acts, policies and plans that incorporated disaster management issues. These disaster management strategies focused on natural resource management and reducing both natural and human-induced disaster risks. Table 8.3 illustrates the chronological development of inclusion of DRR approaches within national acts, policies and plans.

Table 8.3 | Chronological Development of DRR and CCA inclusiveness in national acts, policies and plans

Year	Acts, policies and plans	DRR and CCA related strategies
1927	Forest Act 1927	Forest related risk reduction
1952	House building Act 1952	Earth quake resilient practice
	Civil Defence Act 1952	Civil protection from human-induced incidents
1956	Flood Control and Drainage Act 1956	Human-induced water-logging reduction
1961	Fire Service Rules 1961	Civil protection from fire incidents
1993	Bangladesh National Building Code 1993	Earth quake resilient practice
1996	Bangladesh Environmental Conservation Act 1996	Environmental risk reduction
	Bangladesh Flood and Water Management Strategy	DRR
	Water Supply and Sewerage Authority Act 1996	Human-induced water-logging reduction
1998	National Water Management Plan (NWMP)	Disaster management
1999	National Water Policy	
2000	Natural Reservoir Conservation Act 2000	Wetlands related risk reduction
2003	Fire Prevention and Control Act 2003	Civil protection form fire incidents
2005	National Adaptation Programme of Action (NAPA)	CCA and DRR
2009	Bangladesh Climate Change Strategy and Action Plan 2009	
2010	Vision 2021	DRR and CCA
	National Agricultural Policy	Climate induced disaster risk reduction
	National Plan for Disaster Management 2010-2015	DRR and emergency response
	Bangladesh Climate Change Trust Act 2010	Mitigation and adaption to climate change
2011	Sixth Five Year Plan 2011-2015	Disaster management and climate change
2012	Disaster Management Act 2012	DRR and CCA
	Master Plan for Haor Area (Final Draft)	Haor basin based disaster management
2013	Bangladesh Water Act 2013	DRR
2014	National Disaster Management Policy 2014	DRR and CCA

(Source: Author collected from GoB, 2014_c)

The table also shows that climate change issue has been incorporated in the last decade of national policies and plans. The country is one of the first countries in the developing world developed to have its own NAPA in 2005 (LEG, 2002). In 2009 the government developed the Bangladesh Climate Change Strategy and Action Plan to put an emphasis on adaptation strategies in mainstreaming and integrating DRR and CCA at all levels and sectors. In terms of policy implementation, the government conducts various initiatives to manage disaster risks that have been described in Chapter 3 and 7 in detail. Table 8.4 shows different kinds of hazard specific external assistance by the government and non-government agencies. The table also indicates that the external activities are not only involved in humanitarian response but also reducing their disaster vulnerability and enhancing their capacity to recover disaster losses. The CCA initiatives through BCCTF and external funds (e.g. BCCRF) are primarily focused on solar energy services, eco-friendly stoves and organic fertilizer. Thus, these CCA projects could be considered to be often addressing community level disaster vulnerability to enhance community resilience.

Table 8.4| Hazard specific major assistance from external actors

Sources	Floods	Cyclones
Government	• Social safety net programmes e.g. test relief (TR), vulnerable group feeding/ development (VGF/ VGD) • Embankments and flood shelters • Flood forecasting system • Clustered village for displaced people • Relief works • Flood resilient crop varieties • Trainings and workshops	• Cyclone shelters • Early warning system • Rescue operation • Relief works • Social safety net programmes • Rehabilitation programmes • Coastal embankments • Trainings and workshops
Non-government	• Raising home plinths • Asset transfer programme i.e. livestock • Crop diversification scheme • Relief works • Flood resilient crop varieties • Market development • Trainings and workshops	• Cyclone resilient settlement • Rescue operation • Relief works • Rehabilitation programmes • Trainings and workshops

(Source: Author developed from fieldwork in Bangladesh, January-September, 2012 and December 2012-March, 2013)

8.5.1 Challenges for national policy implementation at local level

The national institutional framework for disaster management in Bangladesh is well-structured. DDM has its offices to Upazila level and CPP covers its network up to community level. Bangladesh is often referred to at the international level for its well-known disaster management initiatives such as flood management and CPP's cyclone early warning system (Wisner et al., 2004; IPCC, 2012, 2014). However, some policies and activities of the government are criticised. Chapter 3 has therefore critically analysed the historical trend of disaster management in terms of its critique. The flood control, drainage and irrigation (FCDI) projects under the Water Development Master Plan is one of the first initiatives by the government to have been criticised. BWDB/GoB (2012) reported that 58 FCDI projects have been implemented throughout the country since 1964. The primary objective of these projects has been to protect agricultural lands and to ensure food security (Brammer, 1999, 2004). The Meghna-Dhonagoda Embankment Project (MDEP) is one of the most controversial FCDI projects situated in Chandpur district (Chaudhury, 1994; Ansary et al., 1997). They also argue that there are many adverse environmental impacts found in fisheries, livestock health and soil structure inside the embankment. Inspired by some large FCDI projects, after disastrous floods of 1987 and 1988, the government had formulated a national water and flood management strategy (Hossain, 2003). Major development partners supported a mega project entitled Flood Action Plan (FAP) to control floods through engineering solutions such as building embankments, dams and dykes along the major rivers of the country, though paying minimal attention to community needs and demands. However, later the government modified its original plan to a new master plan for water management cross cutting more of the concerned sectors.

Cyclone Preparedness Programme (CPP) is considered as one of the successful disaster management initiatives of the government in association with the Bangladesh Red Crescent Society (BDRCS). CPP has attracted the attention of the international arena for reducing death tolls since 1970 through its cyclone early warning and evacuation systems. However, the present study found that a sizable number of coastal people did not receive any warning signals before cyclone Sidr made landfall in their areas. Paul (2012) claims that other factors such as characteristics of the cyclone events and natural barriers also contributed to reducing the death tolls. Afforestation along the coast is an appropriate DRR approach to reduce climate induced disaster

risks (Coppola, 2006). However, the national policy-makers were misled by the location of Sunderbans in the southwestern part of the country. The argument of the relationship between death toll reduction and natural barriers did not apply two years later when cyclone Aila hit the Sunderbans region. The high tides of cyclone Aila easily penetrated deep inside the inlands and breached the embankments and in its representation exposed a politicised ecology (Chapter 7).

DDM activities at local level through different social safety net programmes are often criticised for poor selection of areas and people. Local elites including local government representatives generally can control the distribution of relief. Nonetheless, NGO activities also face challenges in managing local elites. It was observed in the field that some corrupt field level government officials cope with localised political cultures and modify the original targets of the government programmes and projects.

8.5.2 Strengthening policy and the institutional framework

At national level, there should be a common framework for DRR and CCA as the two components are presently dealt by two separate ministries and departments. Considering bureaucratic realities in Bangladesh, the regular functions of the concerned ministries and departments may be continued as it is, but the programmes and projects can be implemented jointly under the Prime Minister's Office (PMO) or the Planning Commission. The major funding mechanisms (such as NDRRF, BCCTF, BCCRF) may be merged to prioritise urgent needs and implement them according to the respective acts, policies and plans. Further the government needs a strong platform for DRR and CCA at local level to genuinely integrate DRR and CCA approaches as informed by the local level. The best contextual solution may be to strengthen the organogram and capacity of DDM. The recruitment of both technical and non-technical staff may enhance more measured technical solutions as well as an understanding of the localised social factors. The government may allocate fixed funding mechanisms for the local governments, particularly union councils as they have no funds for conducting training and workshops and other relevant functions.

8.5.3 Coordination between government agencies and NGOs

It was observed from the fieldwork that as with the local level, there are gaps between the strategies and activities of the government and NGOs at national level. The government can monitor and supervise the NGO activities by law. However, INGOs can often implement their functions according to their aims and objectives. Though the government strongly monitors and supervises the NGO activities at the local level, it is often not possible at national level due to donor interests, bilateral and multilateral agreements and national level pressure groups. However, it was observed that recent big programmes by development partners (such as RBP, CLP and SHOUHARDO) have included the government roles with a minimal financial contribution. For example, the government contributes two percent of the total budget for logistic supports for the government officials involved in CLP (Phase 2) and the rest of 98 percent is funded by DFID and AusAID (CLP, 2015). In contrast, the government financial mechanisms sometimes also include NGOs, particularly local NGOs. For example, BCCTF allocates funds to 61 national and local NGOs through the *Palli Karma-Sahayak* Foundation (Rural Employment Generation Foundation) for DRR and CCA related projects (PKSF, 2015). The synergy between the government and NGO policies and activities at national level is needed for strengthening local level institutional frameworks that can assist to implement an integrated DRR–CCA at all levels.

8.6 Implications for international level risk management

The UNISDR and the UNFCCC are the two main mechanisms at the international level that function for DRR and CCA, respectively. In addition, though other international law and practice addresses both DRR and CCA, the relationships between these legal goals and responsibilities in these areas of global action and management are complex and inadequately understood (IPCC, 2012). At international level, though it has been agreed that both DRR and CCA are strengthened through mainstreaming and integration at all levels across the concerned sectors, these two components have not been well-connected in terms of policy formulation, institutional framework and financial mechanism (Birkmann and von Teichman, 2010). The HFA is often considered as a ‘soft law’ in international law (Pelling, 2011) and the governments simply agreed and adopted the framework as a set of recommendations for reducing disaster risks at national and local level (IPCC, 2012). The HFA did not

set any targets and indicators of progressions (ibid.). However, later on, such as through the Sendai Framework for DRR guideline of targets and indicators of progress are given (UNISDR, 2008; UN, 2015). In contrast, the UNFCCC primarily focuses on mitigation approaches rather than on adaptation strategies (IPCC, 2012).

Implementation of international level policies and decisions needs long-term plans to obtain the expected outputs and outcomes at local level (ibid.). The international level actors referred to the urban areas to prove that local level DRR and CCA can produce interrelated success cases. However, they often inadequately realise the strength and capacity of local actors, particularly in the rural areas of developing countries. The present study revealed the local government system in rural Bangladesh hardly takes on its own action plans due to financial constraints instead acting as an associate with the (national) government institutes at local level for implementing the government's policies and political decisions. In addition, at the international level, community-based adaptation (CBA) approaches are often mismatched with different components such as natural resource management, environmental management, DRR and climate change (van Aalst et al., 2008), that pay minimal attention to the differing community adaptation to contextual seasonal variation and predicted future climatic risks. Thus, the international and national level actors need to put more emphasis on understanding localised vulnerability and capacity to adapt to seasonal variation and to cope with environmental disasters, to implement an integrated DRR–CCA at local level through community engagement in all decision-making processes.

8.7 Integrating DRR and CCA at local level: Challenges and opportunities

The demand for local adaptive capacity to seasonal variation and coping mechanisms for environmental disasters with beneficial external DRR intervention raises the question of how community knowledge and experience of disasters and DRR practice can be best incorporated. Some of the main topics in integrating community knowledge and experience into the new external intervention of DRR–CCA revolves around a lack of space for understanding and sharing knowledge and experience between internal and external actors at local level (Gaillard, 2007; Birkmann and von Teichman, 2010). Further the local level practitioners in rural Bangladesh are experts of implementing DRR approaches and their knowledge and experience of DRR may help to implement new CCA initiatives at local level (IPCC, 2012). The process of

integration of DRR and CCA largely depends on how the external actors perceive and utilise local knowledge and experience in their plans and activities.

8.7.1 Challenges of DRR approaches: Implementation gaps

The challenges of DRR approaches have already been discussed. The social safety net programmes are conducted at the post-disaster rehabilitation and reconstruction phase through creating seasonal employment opportunities for the vulnerable groups during lean periods. However, the government programmes ensure ample spaces for the local elites to have control over work plans and the distribution of jobs and resources. The study also revealed some community-based approaches (e.g. CPP early warning system) that sometimes fail to ensure community participation. Further it was observed that the government and NGO activities and working areas often overlapped due to lack of proper coordination. Apart from these limitations, the DRR approaches have helped people and communities to cope with environmental disasters. Chapter 7 has already illustrated that how external interventions, particularly the government programmes and projects are implemented during and after disasters. These are often focused on emergency response and post-disaster rehabilitation and reconstruction activities. The study also revealed why communities in Jamuna river basin often refuse to go to flood shelters for longer periods instead deciding to stay in their own fragile houses. Development partners deliver resources and services to communities in the light of a disaster preparedness perspective. The study also revealed that some recent donor funded programmes have been implemented some effective risk reduction approaches such as raising home plinths and transferring assets (e.g. cattle rearing and home gardening), although they had failed to involve the community comprised of mainly vulnerable groups. The beneficiaries however helped the development partners to readjust the structure and design of a house plinth that can accumulate a main house, cow-shed, sanitary latrine and tube-well platform.

External actors often interpreted local realities as to how they observe and experience these phenomena in their own ways rather than understanding community feedbacks. Further sharing of the knowledge and experience of development programmes and projects are minimal between the government and NGOs due to a lack of institutional coordination. The professional rivalry between government and nongovernment staff may be a constraint for strengthening coordination and cooperation amongst the actors for DRR and CCA. In these circumstances, implementation of an integrated DRR–

CCA at local level requires the policies and actions of the government and NGOs engaged in existing proven DRR approaches and local level development processes that can reduce institutional burdens and implementation costs.

8.7.2 Climate change as a threat to disaster management system

The thesis critically analysed the uncertainties of climate change impacts at local level by referring to the case of rural Bangladesh (IPCC, 2007, 2012). The range of appropriate measures (both mitigation and adaptation) for reducing expected climatic risks is vast and these measures need an extensive technical and financial contribution, particularly in developing countries which are also considered highly disaster prone (ibid.). The international and national level stakeholders need to consider how DRR approaches are the entry point for CCA initiatives at local level. Conversely, predicted climate change impacts and their widely differed measures can be a threat to existing disaster management systems including community knowledge and practices.

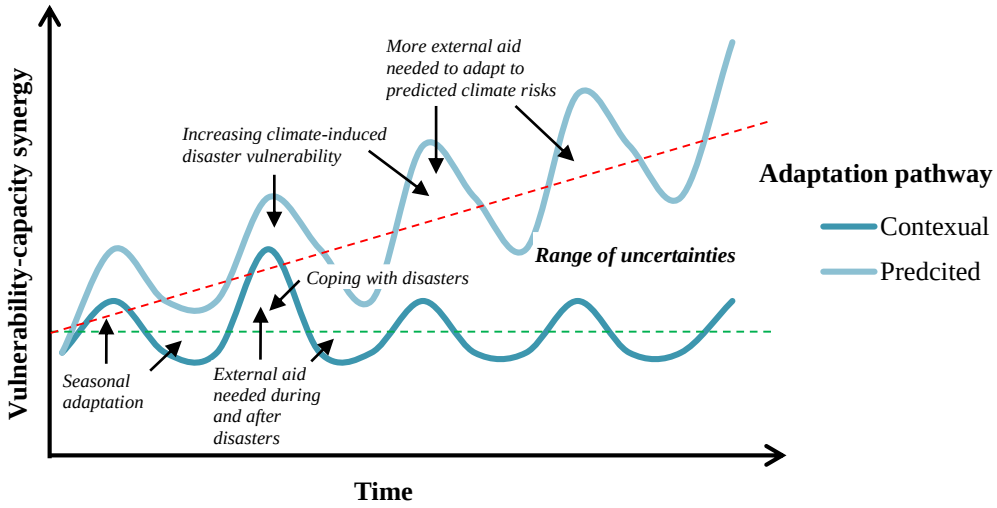


Figure 8.5 | Understanding uncertainties of future climatic risks through contextual and predicted adaptation pathways

(Source: Author)

Figure 8.5 illustrates the contextual and predicted adaptation pathways of an environmental disaster – climate change perspective in terms of understanding uncertainties of future climatic risks. The contextual pathway describes how

communities adapt to environmental phenomena (e.g. natural hazards and seasonality) through using their own knowledge and resources and need to cope with extreme events whilst external assistance is required. In contrast, the predicted adaptation pathway moves forward towards uncertainties and needs more external aid to minimise the unacceptable climatic risk burdens on communities.

However, predicted climate change impacts and expected adaptation strategies at international level are hardly visible at the local level (Birkmann and von Teichman, 2010), and that can convey wrong information to local level development practitioners. The study identified that the international and national level actors believed climate change was the sole reason behind the incidence of recent cyclonic events and they transferred the information to the local actors in coastal Bangladesh whilst they neglected the other social and political factors – critically illustrated in the empirical chapters. If the community perceptions of climate change impacts are possible to measure, it will help to reduce the predicted but unbearable robust investment for integrating CCA strategies into DRR approaches at the local level. Thus, community participation is needed in all local level decision-making processes such as risk identification; protective and adaptive measurements; and action plans.

8.7.3 Implications for community-based DRR

Adaptation is often conceptualised as a strategy of community preparedness and action to adjust to climate change (Ebi, 2008). The prevailing understanding of community-based adaptation (CBA) insists on conducting community risk assessments (CRAs) for CCA, and these assessments embrace environmental hazards, vulnerabilities and capacities of communities (van Aalst et al., 2008), although all aspects of CRAs are hardly able to include the vulnerable groups (Douglas et al., 2009). Further the secondary data on climate change is rarely utilised in CBA approaches because of the challenge of limited access to downscaled climate change scenarios related at local level and the uncertainties of projected risks (Ziervogel and Zermoglio, 2009; IPCC, 2012). In these circumstances, community-based DRR is able to identify localised risks of climate-induced disasters through their understanding of disaster risks in general and recent extreme events in particular.

> "We can combat Sidr again in future but we need proper timely help from the government." (Interviewee 6: the fisherman at Sidr village, June-July, 2012)

Like the fisherman from the coastal Bangladesh, most Sidr survivors believed that they have their own capacities to cope with cyclone risks. Here he labelled 'Sidr' as a benchmark of severity of cyclone impacts on their lives and livelihoods which they will need to overcome in the near future. However, external assistance is still needed for enhancing their disaster resilience. Further he mentioned 'proper timely help' suggesting the weakness of existing DRR policies and actions that needed to be addressed. Moreover, the comments from these sources also indicated the inefficiency of local level service providers in dealing with new CCA applications. It was observed from the fieldwork that most government and NGO staff at the local level utilise their existing experiences gathered from disaster management activities for implementing new CCA initiatives. Further, the participants of FGD sessions argued that they feel comfortable in discussing their disaster vulnerability and capacity enhancement rather than climate change in training sessions and workshops provided by government departments and local NGOs.

> "Recently we know about climate change adaptation. To be honest, I have no clear idea about it but we are using our experiences of working at disaster management projects." (Interviewee 20: a government staff aged 38, Aila village, July-August, 2012)

All stakeholders at the local level, dealing with both DRR and CCA, interpret climate change and its potential adaptation strategies based on their own existing knowledge and experiences. This will be a major challenge for implementing CCA strategies at the local level which is not properly addressed by the climate change negotiators. However, this was also supported by Bangladeshi academics.

> "In Bangladesh, the impact of climate change mainly exposes the uncertainty of disasters. ... Though there is still lack of coordination of implementing DRR approaches, I think it would be the right way to implement CCA applications at community level." (Interviewee 28: a university professor aged 56, Dhaka, March, 2013)

The professor revisited the underpinning of how climate change exposes the country like Bangladesh to its high proneness to disasters due to geographical location and 'monsoon' climatic characteristics. He also pointed out the limitations of implementing DRR approaches due to institutional weaknesses. Though he did not mention specific details it indirectly indicated that the existing institutional structure is not fully ready to execute CCA strategies. This was so through considering the context

of local people's perception and responses. Moreover, though DRR is a suggested entry point for CCA applications (Mercer, 2010), consideration of both present theoretical underpinnings of DRR and CCA at the global level and individual observations of people's vulnerability and coping mechanisms at the community level were further confirming the likely validity of the feedback from the respondents.

As active community engagement is undoubtedly important in boosting output of developmental actions (Brokensha et al., 1980; Campbell 1990, 2006; Inglis, 1993; Nunn and Britton, 2001; Gaillard, 2007; Nunn et al., 2007). Community based DRR minimises external institutional weaknesses where it could build an internal institutional structures for implementing an integrated DRR–CCA at the local level. In such a manner, it can strengthen capacity for dealing with disaster risk in climate change contexts.

8.8 Community engagement in local level external intervention

In both a DRR and CCA context, many social scientists argue that the globally uniformed approaches to manage disaster and climate risks often neglect how people and communities experience risks and the factors that make them vulnerable (Blakie et al., 1994; Wynne, 1994, 1996; Sen, 1999; Bassett and Zeuli, 2000; Wisner et al., 2004). Many government and development partners' programmes and projects in developing countries in 1970s and 1980s failed to achieve the project goals of poverty reduction through sustainable rural livelihoods, because of bureaucratic and professional control over the project activities (Chambers, 1997; Scott, 1998; Cornwall, 2002). In these circumstances, community engagement became more prominent in development studies and practices. The concept of community engagement was initially popularised within local NGO community and later taken up by the national governments and wider international development organisations (Williams, 2004). Since the 1990s, development programmes and projects have been utilising community-based approaches in the developing world through a decentralisation and participation perspective (Wong, 2010). However, many of these external interventions are locally controlled by local elites, although the programmes and projects are initially designed for vulnerable groups (Mansuri and Rao, 2004). The present study revealed that community engagement in local level intervention, if truly

participatory in the sense of actual engagement, may accelerate the processes of implementing integrated DRR–CCA approaches.

8.8.1 Challenges for community engagement

The 'top-down' managerialist approaches of the 1980s and 1990s in development practice (Cornwall, 2002) were replaced by more community-based orientations since the 1990s through decentralising decision-making processes to the community level (Wong, 2010). But these community-based approaches have also often failed to understand societal power relations and the nature of elite capture (Mehta et al., 1999; Masaki, 2007). In the sociological view of institutions, neo-institutionalism thinkers criticise the failure of community-based development programmes and projects for their poor institutional framework at local level (Iversen et al., 2006). The present study suggests that strengthening the existing government institutional framework for disaster management in Bangladesh (such as DDM) may be useful for implementing more representative government functions of DRR and CCA at local level. In addition, the local governments, particularly union councils and union disaster management committees, have legal and administrative authority to conduct their responsibilities but these local institutions need a guaranteed financial flow. The present study also revealed how local elites can mobilise, accumulate and invest in development programmes and projects (Platteau and Gaspart, 2003), although the projects often target the poor and vulnerable women. For example, it was observed at Bonna village that a donor funded programme helped the vulnerable groups by raising their home plinths above the 1998 flood level and transferring assets such as resources for cattle rearing and home gardening. The local elites played an influential role in beneficiary selection and they further influenced the project beneficiaries in terms of purchasing cows and other assets. Indeed, they got commission from the sellers. The project personnel realised the mechanisms but they gave the opportunity to the local elites for the success of their programme referred to elsewhere as the 'co-opt-elite' approach (Platteau and Abraham, 2002). In contrast, a 'counter-elite' approach suggests confronting elites by completely removing them from local level decision-making processes through community empowerment and political citizenship (Mohan and Stokke, 2000; Hickey and Mohan, 2004).

The recent development programmes have been uplifting the socio-economic conditions of the extremely poor households in Jamuna river basin whilst these

'target-oriented' programmes depressed the next level vulnerable group to more fragile conditions. These vulnerable non-beneficiaries have limited access in decision-making processes. Chapter 7 has explored how the vulnerable non-beneficiaries go to collect drinking water from the tube-wells owned by the project beneficiaries and tensions are gradually increasing amongst the vulnerable groups. It was observed that the local elites are more vocal at project meetings than the vulnerable beneficiaries. However, the study suggests a 'whole-of-society' approach would better include the fuller community in local level development processes and this helps to implement an integrated DRR–CCA intervention.

8.8.2 Opportunities for community engagement

Some community-based approaches have focused on community involvement and responsibilities in natural resource management (Forsyth and Leach, 1998). The experiences of these initiatives have accelerated the idea of introducing CBA approaches confronting the UNFCCC-led global policy oriented adaptation strategies, to identify, assist and implement local level development plans and activities. These aim to enhance people and societies to adapt to environmental (and other) risks in complex and diversified vulnerability contexts (Jones and Rahman, 2007; Ayers and Forsyth, 2009). The present study has already explored that although environmental disasters affect severely vulnerable groups in terms of food and livelihood security, the economic losses and damage of other groups, particularly the well-off group are also high. The study also found a diversified adaptive and coping capacity amongst the different classes of communities. The outsiders may utilise this enriched and diversified knowledge and practice at community level in decision-making processes through including the whole community in local level external intervention.

Though there is no legitimated provision to create village or community level disaster management committees and plans, it was observed from the fieldwork that the local NGOs often do assessments (e.g. vulnerability and capacity assessment) and action plans (e.g. CBDRR plan) to fulfil their programme and project needs. Thus, the maps and reports of different NGOs and programmes are varied. CDMP conducted some CRAs in some selective villages throughout the country (CDMP, 2015). These assessments and planning are often done by the concerned beneficiaries in the presence of local elites. However, these gaps can be minimised through strengthening local institutions to prepare community-based assessments and action plans in the

presence of a whole community that indicates their willingness to the ‘co-opt-elite’ approach. Wong (2010) argues that a ‘co-opt-elite’ approach driven trans-boundary water governance project in northern Ghana has further legitimised the ruling of the local elites. However, learning from the recent donor funded programmes in Bangladesh, suggests a ‘whole-of-society’ approach at the local level intervention in complex and diversified socio-political contexts of rural Bangladesh would be beneficial.

8.9 Gender-sensitiveness in DRR, CCA and sustainable development in policy and practice

This research has taken place with a clear knowledge that some groups of people are more vulnerable to environmental hazards than others (Wisner et al., 2004). These vulnerable groups include women, children, senior citizens, the poor and so forth. Gender disparity leads to differential vulnerability (Wisner et al., 2004; IPCC, 2012, 2014) and differential mortality from environmental disasters (Ikeda, 1995; Neumayer and Plumper, 2007) and the issue is difficult to address due to the existence of gender differences in day-to-day life in society. This study investigated gender-specific vulnerability and coping capacity to disasters in Jamuna river basin as described in Chapter 5 and 6, respectively. Though food security has been the common top priority on the vulnerability list, men ranked the livelihood related vulnerabilities at the top whereas women paid more attention to the vulnerabilities related to their domestic responsibilities, and personal hygiene and privacy. The study also revealed that xwomen are more vulnerable to tropical cyclones than men within the same socioeconomic scenario in coastal Bangladesh (Ikeda, 1995; Fothergill, 1996; Morrow and Enarson, 1996; Peacock et al., 1997). Chapter 7 has demonstrated that external intervention in rural Bangladesh often targets women, particularly female-headed extremely poor households and that this can empower women to participate in local level DRR activities (Enarson and Morrow, 1997, 1998; Fothergill, 1999, 2004; Hamilton and Halvorson, 2007; Enarson, 2010; IPCC, 2012, 2014).

As women are more vulnerable to environmental risks than men, adaptation policies and strategies should threfore consider gender-specific issues to reduce climate change related vulnerability (Nelson et al., 2002). The UNFCCC through the NAPAs in the developing world recognised the differential roles of men and women in sustainable livelihood context (Shabib and Khan, 2014). The HFA and the Sendai Framework for

DRR also emphasised on integrating gender perspective into DRR policies, planning and programming in disaster prone countries (UNISDR, 2007; UN, 2015). Further the international financial mechanisms ensure that gender-specific data in approving programme and project proposals to identify gender-specific risk factors and adaptation strategies (UNFPA and WEDO, 2009; UNDP, 2010). Shabib and Khan (2014) reveal that the climate change related policies in Bangladesh generally identified women as vulnerable but operational responses to adaptation strategies have not yet been established. They also add that gender issues are excluded from operational plans in regular NGO activities and the government programmes (e.g. CDMP). The present study revealed that though the majority of the beneficiaries of the donor funded programmes such as RBP, CLP and SHOUHARDO in Jamuna river basin are women with extremely poor backgrounds, those women are involved in formal group meetings including union disaster management committees and planning. However, for the important meeting and round table discussions organised by local governments and NGOs that are often held at union council offices or school buildings, women participation is generally ornamental. The meetings and training organised inside their char-land or village, the women, particularly project beneficiaries have actively participated.

Women as natural and environmental resource managers and pivotal implementers of development initiatives at the community level, have the knowledge and experience to build the adaptive capacity to natural hazards and coping strategies and mechanisms to environmental disasters (UNISDR, 2008b). This study revealed that the vulnerable women received technical and financial supports from development programmes funded by some large donors for home gardening. The women are not only financially benefited from this but also able to contribute through it to household level food security, particularly for lean periods (Choudhary and Parthasarathy, 2007; Sikod, 2007). Without women's active participation in community-based decision-making, leadership and planning, the targets of implementing an integrated DRR–CCA at the local level are not achievable (UNISDR, 2008b). However, women are still marginalised from the community and local level decision-making and development planning processes in many places in the developing world. The study found that though there are a few women-led formal associations or organisations for dealing with disasters and climate change issues in rural Bangladesh, the informal women's groups and associations, mostly under the microcredit schemes run by NGOs can be

utilised for empowering vulnerable women. Furthermore, gender-sensitive innovative tools and techniques are needed for active women participation in integrating DRR–CCA at the local level. The present study discovered some women-innovated indigenous techniques in seed preservation[20] that has empowered rural women in contributing to agricultural development. As women are vulnerable to disasters and future climate extremes and the nature of their vulnerability differs from that of men, gender-sensitive policies, action plans, and gender-sensitive tools and techniques should be undertaken by the external stakeholders working in the field of DRR and CCA. Considering these challenges and opportunities of women's empowerment and active engagement in community-based decision-making and planning processes can be effective for implementing an integrated DRR–CCA approach towards sustainable development.

8.10 Summary

This chapter has discussed the key empirical findings presented in Chapters 5, 6 and 7 in relation to existing DRR and CCA literature and conceptual ideas especially referencing Bangladesh and linking to that raised in Chapters 2 and 3. In doing so the implications of integrating DRR–CCA at the local level in rural Bangladesh context have been further synthesised though highlighting its complex nature and reinforcing how there are differing impacts to be had locally. The study revealed that DRR strategies can act as adaptation strategies to climate change but that this urgently requires a full community engagement in local level intervention.

Some of the vital considerations emerging from this discussion are the implications of increasing DRR and CCA on people and societies. Community perception differs in both space and time depending on how certain risks are presented in everyday life. However, local perceptions are not only created through how local people perceive and experience rather how their perceptions are embedded in the knowledge of external actors. Communities live in multiple hazard prone areas because of their

[20] Women in Seed Entrepreneurship (WISE) a donor funded project has been implemented by Rural Development Academy (RDA), Bogra in northern Bangladesh for preserving rice seeds (mainly local varieties) at farmers' houses and developing seed business by rural women. The project adopted the indigenous techniques of seed preservation in rural Bangladesh and trialled the preserved healthy seeds in farmers' demonstration plots for multiplying more healthy seeds. Later the project beneficiaries developed the idea to involve in seed business which was predominantly controlled by men. The recent activities of the project have been expanded in different char-lands of Jamuna river basin intending to involve the vulnerable char women. (Zakaria and Akhter, 2010)

ownership of natural resources, social capital, community cohesion, and for preservation of dignity. Though access to resources and services are highly classified, their diversified livelihood strategies help them to adapt to certain seasonal variation and to cope with the uncertainties of disasters. For a climate change perspective, communities will need to adapt to uncertainties of future climatic risks.

Implications of DRR and CCA on local level development practitioners are varied depending on coordination between different actors and scales. UP, the lowest tier of local government system in Bangladesh, has little legislative and administrative power to exercise their roles according to different national policies, acts and plans; they monitor and supervise DRR and CCA activities. In the case of Upazila councils, this second tier of local government system of the country has comparatively more legislative and administrative influence to exercise over DRR and CCA activities in its territory. The (central) government often implements these activities and programmes through this, its own institutional framework. In contrast, NGOs have little space to contribute to national policies and operational activities. It is necessary to improve the strengthening institutional frameworks at local level through building strong coordination and cooperation between actors at different scales.

The study has revealed that the government emphasises formulating more sophisticated policies and plans of mainstreaming and integrating DRR and CCA rather than executing effective operational responses to the existing acts, policies and plans. A common operational and financial platform is needed for implementing an integrated DRR–CCA at local level. Unlike at local level, the government cannot strongly monitor and supervise NGOs policies and plans from a national level due to political influences. However, the lack of coordination and cooperation between national actors often creates implementation gaps at the local level that may hamper the mainstreaming and integration processes. Furthermore, the global policy-oriented DRR and CCA approaches are often mismatched with how community experience and understand vulnerability and environmental risks; how they adapt to and cope with existing hazard and disaster risks; and what external support may be needed for their adaptation to future climatic risks. Thus, the international and national level actors should emphasise understanding of localised vulnerability and capacity to implement an integrated DRR–CCA at local level.

The study has also explored that there are some limitations in DRR approaches in Bangladesh. These limitations include elite capture for local level external interventions, target-oriented approaches and a failure of CPP EWS in the case of cyclone Sidr. Some recent development programmes have achieved their goals through applied 'co-opt-elite' approaches in their local level activities. Further CPP operations were more effective within two years for the case of cyclone Aila. However, climate change is a threat to the existing DRR systems in Bangladesh due to lack of knowledge and information about the wider range of adaptive measures needed to address the uncertainties of future climatic risks. Apart from these limitations, the study however suggests that community-based DRR approaches may be the frontline adaptation strategies for climate change in the context of rural Bangladesh.

The study also explored how a 'whole-of-society' approach helps to understand localised vulnerability and capacity through community engagement in external interventions. As individuals and communities experience differential vulnerabilities, their knowledge and practices are also diversified. The policy- and target-oriented approaches generally fail to accumulate the whole communities as a whole to understand collective knowledge and practice for coping with disasters. The study also revealed that these target-oriented approaches often select the poor and vulnerable groups in their project activities but unintentionally craft 'counter-poor' knock on effects within the same society. A 'whole-of-society' approach can solve the problem by ensuring the whole of community engagement in local level decision-making and development planning processes.

The study found that the national policies and plans of the country recognise gender issues, but the issue has been insignificantly addressed in practice. Further the study identified that the women of rural Bangladesh are involved in diversified responsibilities for managing natural resources in their localities and ensuring household food security. Some projects assist them to be empowered through household- and community-based income generating activities. However, their presence in local level decision-making and planning processes is still negligible due to socio-political constraints. Thus, the study suggests a gender-sensitive approach is very much needed for the implementation processes of DRR and CCA at local level.

This chapter has integrated an examination of CCA into existing DRR systems in rural Bangladesh. By discussing the implications of DRR–CCA on the different actors involved in the whole system the chapter has highlighted the complexity of progressing actions around this issue. It has also identified the potential for community-based DRR approaches and the means by which they could be better supported to act as adaptation strategies. The following chapter concludes the main arguments made in this thesis and details its wider research implications.

Chapter Nine

Conclusion

CHAPTER NINE

Conclusion

9.1 Introduction

This thesis began with the aim of examining the present scenarios of DRR and CCA integration at local level in rural Bangladesh. It focused on local level integration of DRR and CCA in response to implementation of international and national policy frameworks. The study also identified what kind of governance and institutions are needed to ensure community participation in the total process of local development that can encompass DRR and CCA. Using an inductive methodological approach, the research presented a detailed examination of social vulnerability to environmental disasters in a changing climate. This delivered critical understandings of local knowledge, experiences and practices of coping with disasters, and the processes of transformation and inclusiveness of communities into external interventions at the local level. The study has also highlighted the predominant and widespread use of DRR strategies and applications by communities and external stakeholders for managing disaster risks. By the way of contrast, it expressed the challenges of implementation of recent externally driven CCA initiatives at local level. It has revealed the potential of local knowledge and practices of disaster management through community engagement in local level intervention. This examination of local knowledge and practices of DRR is valuable in that it provides an in-depth understanding of social vulnerability to and community capacity to deal with disasters in a changing environment. This understanding derives from the processes of researching, through a qualitative method approach, the existing DRR and recent CCA initiatives in rural Bangladesh. It contributes to a limited base of experience based literature concerning community engagement in local level interventions. This informs the manner in which a drive to mainstream an integrated DRR–CCA in developing countries could best progress.

This concluding chapter draws together the main ideas of the thesis in order to highlight how this work achieved its aims and objectives, contributes to advanced academic knowledge and to consider possible directions for future researchers and policy-makers. The chapter starts by summarising the understanding gained of disaster vulnerability and community capacity in Bangladesh’s changing climate.

9.2 Lessons from the disaster – climate change nexus: Community vulnerability and capacity

The present study established that disaster vulnerability is gradually increasing the challenges of community capacity in the context of climate change amongst three research sites of Sirajgonj, Barguna and Satkhira districts. The respondents of the study, particularly the char-dwellers of Jamuna river basin have inherited knowledge and experiences of confronting floods and river bank erosion. They classified floods in terms of severity and the timing of an individual flood event (section 5.2.1). The respondents, particularly the senior citizens showed that they perceive climate change through their understanding of exposure and vulnerability to localised environmental disasters (section 5.2.2). They also defined future climatic risks as being primarily related to natural hazards in general but the scenarios of localised livelihood and food security in particular.

By focusing on people's exposure and vulnerability within a disaster prone environment in rural Bangladesh it is possible to understand how well communities are able to manage disaster risks in climate change context. Apart from their exposure to environmental disasters due to geographical location and remoteness, the study explored how seasonality and natural resource dependency shape the nature of social vulnerability. However, the study was aware of and also focusses on the political dimensions of vulnerability such as globalisation, geopolitics, and impacts of international agreements and national policy on local politics. It examined the relationship between globalisation and environmental disasters and how they influence local people's livelihoods including through forced migration from coastal areas of Bangladesh to major cities including Dhaka. The socio-economic dimensions of vulnerability comprise a crucial aspect of this study.

Understanding community response to disasters and climate change is vital for managing risks. This thesis demonstrated how individuals, households and communities in the three study villages implemented traditional knowledge and utilised natural resources in strategically coping with environmental disasters. It has been understood from the field research in Jamuna river basin that community coping strategies are primarily associated with their livelihoods such as cropping intensity, diversified livelihood options and seasonal migration (Chambers and Conway, 1991). Additionally, this study found that there are many household level coping strategies during and after severe floods and some of these are gender-specific such as through

low quantity and quality of food intake, and the ways of collecting fuel for cooking and fodder for livestock. It has been understood from the study that coping with tropical cyclones is distinct from coping with floods and river bank erosion. The field data from Barguna district showed a substantial number of the cyclone survivors did not respond to the Sidr emergency of 2007 but did respond two years later in case of cyclone Aila. Self-experience motivated not only Sidr survivors but also local CPP volunteers and field administration to respond to Aila without waiting for confirmed early warning.

This thesis showed how globalisation enacted here through shrimp farming, and environmental disasters together influenced the mobility process in a phased manner in Satkhira district. Firstly, sharecroppers, who were usually landless or marginal rice farmers, primarily migrated to urban areas loosing their jobs in the process. Secondly, short-cuts and easy supply of saline water to shrimp farms made river embankments more vulnerable to erosions, resulted in further loss of land and consequent forced migration. Thirdly, some wage workers also lost their jobs because of reduced production due to increased prevalence of spot disease resulting from the uncontrolled use of saline water in shrimp farms. Finally, the cyclone Aila triggered mobility due to damage to fragile embankments followed by the sudden loss of livelihoods related to agricultural production including fisheries, poultry and shrimp. However, apart from community response being from within, the study revealed that external interventions helped individuals and communities to cope with disasters.

9.3 The extent of appropriate and inappropriate external interventions

The prevalence and nature of external interventions identified in the study adds further weight to arguments promoting analysis and examination of the forces that underscore management attitudes and behaviour. Specifically, this provides scope for refining the debate on the appropriateness of many external interventions in climate change context. By utilising detailed qualitative measures it was possible to examine how the new CCA initiatives have been incorporated into the existing DRR practices within a debate surrounding levels of appropriate and inappropriate interventions.

It has been learnt from the study how strategies of external interventions have changed over time in the Jamuna river basin: from relief and response to livelihood oriented DRR approaches. The paradigm shift of disaster management in the char-lands has

assisted the flood survivors to reduce their relief dependency. However, the study revealed the concept of 'the poorest of the poor' has been implemented in several development programmes and projects, and this target oriented approach has uplifted a vulnerable group by depriving other vulnerable groups. Similarly, the study identified that the concept of 'counter-elite' might not work properly in the study areas as the marginalised people have least access to natural resources, local instituions, marketing channels and local planning and decision making processes. Moreover, their life and localised livelihoods primarily depend on the decision of local elites. The later idea of 'elite co-opt' by development partners better helped by incorporating them into their project activities and selection of potential beneficiaries, and implementing 'asset transfer' schemes. At Bonna village, the local elites were involved in beneficiary selection and cattle purchase processes. This represented more of a 'whole-of-society' approach for enhancing disaster resilient communities by ensuring participation of all groups in local level planning and implementation processes.

This thesis addressed the distinction between community-based and local level interventions. With the special focus on CPP the study argued that all community-based programmes are not truly community-based. Apart from the international recognition of CPP, the study revealed CPP early warning and rescue to shelter system was not properly operated at the grass roots level during cyclone Sidr due to the failure of community engagement in these processes. CPP activities were not operated in three districts of the southwestern part of the country before cyclone Aila due to misconceptions about the 'Sunderbans' being a natural barrier that would protect those areas from tropical cyclones. Inappropriate management of embankments failed to protect the communities during Aila and the unprepared people living behind the embankments were destructively affected. The transformation of cultural landscapes in the study village of Satkhira district from rice farming to shrimp farming as well as corruption in infrastructure development accelerated the processes of unplanned water management at local level. This occurred through the cutting down of the embankments at several points and making them fragile to a moderate cyclonic event such as Aila.

The study also revealed that the national level academics and policy-makers in Bangladesh often argue that the recent cyclone damage was due to climate change impacts. This argument suppresses the actual reasons of embankment collapse such as

unplanned water management in shrimp farming and corrupt development. Aila changed not only the perception of the people (both local and external) but also the scenarios of external interventions: from skill development in shrimp production and water management through maintaining local embankments to awareness building and infrastructural development to address climate change. However, the recent unplanned CCA initiatives had failed to understand actual localised vulnerability.

9.4 Adapting to climate change through DRR: A community perspective

One of the central features of the thesis was exploration of DRR practices as CCA applications at community level. This study revealed the prevalence of DRR initiatives in terms of their efficiency as adaptation strategies to climate change from both disaster survivors, and DRR and CCA professional perspectives. As discussed in the previous chapters, community knowledge and experience driven DRR initiatives can assist both communities and local level professionals to implement external interventions in the DRR–CCA context.

The study also examined how community perception of disasters and climate change can help external stakeholders to implement their activities. The coping strategies and mechanisms of communities often ensure their livelihood and food security in a disaster context. Similarly local level development practitioners are well-experienced in implementing DRR activities at local level. The study also identified that there is a lack of coordination amongst the actors at local level through an implementation gap that hampers the process of integration of DRR and CCA. Thus new CCA initiatives can be best incorporated into existing DRR strategies through ensuring community engagement in local level planning and implementation processes.

Having concluding the main empirical outcomes of the study, the following sections reflect upon themes for further research, policy recommendations and research limitations, before providing concluding remarks on the research objectives and the thesis as a whole.

9.5 Further research, policy recommendations and limitations

The outcomes of the thesis suggest possibilities for further research into the potential contribution of DRR as a significant part of what we consider to be climate change

adaptation. This however requires understanding of local development and change hitherto neglected. The research has therefore also examined the benefits of community engagement in local level external interventions with specific reference to the flood prone Jamuna river basin and cyclone prone coastal belt in Bangladesh. In doing so the research assists in revealing the importance of identifying appropriate and inappropriate DRR approaches. Although the research specifically focused on the case of DRR and CCA approaches in rural Bangladesh and the study villages accessed are unique, the implications of these findings are likely to have revealed similar factors and relevance for other areas of the country and other developing countries. Therefore, given the lack of research on the topic within disaster and climate change prone contexts such as Bangladesh it would be valuable to conduct further studies of a similar nature and approach in order to compare findings from other regions of Bangladesh and other developing countries. Further an ongoing research process is required to examine current and future DRR–CCA initiatives and interactions between external actors and communities.

An area of future research which emerges from the ideas and findings in this study, but not explored in focussed detailed, is the potential impact of wider development activities on reducing disaster risks in the context of climate change. Conversely how DRR and CCA activities influence on other development plans and programmes by both the government and NGOs. The present study ascertained the need for community engagement in local level interventions that enable adaptation to CCA through DRR. It was not able to predict what long term impacts such initiatives based on this local level adaptation would have on future climate change impacts. Given the propensity for DRR approaches in response to community-based adaptation in Bangladesh, and unavailability of local level climate change reaction, there is a need for research that investigates how community vulnerability and capacity for CCA through DRR will change in future.

9.5.1 Policy recommendations

In terms of policy recommendations the study suggests a number of key areas should be addressed to better understand the integration of DRR and CCA and to provide a more supportive environment which will enable the whole community to engage in local level external interventions. Firstly, both the government and NGOs should enhance their coordination for implementing DRR and CCA activities and avoid

overlap through their strengthening of local institutions. The study suggests the local institutions need legal and financial authority to monitor the DRR and CCA activities by the government and NGOs in their respective territories and to be able to implement local plans of action. Climate funds should be utilised for micro-scale projects rather than macro-scale programmes. Secondly, communities should be encouraged to engage in local level action planning addressing climate change issues. At the primary stage, some villages can be selected throughout the country as model villages to identify appropriate local knowledge and practice and therefore implement them with other villages. Thirdly, the government should maintain a common database accumulating all information of good knowledge and practice at community level throughout the country to ensure easy access for all stakeholders of DRR and CCA. Finally, academics should be involved in more in-depth studies to understand community perception, knowledge and experiences to help bridging the gap between traditional and scientific knowledge.

9.5.2 Research limitations

The first limitation related to the timing of the study. As elaborated in Chapter 4, the researcher was familiar with the study villages in Sirajgonj and Barguna districts before the present study started, but the third village in Satkhira district was a new area for him and his research team. The external intervention addressing climate change was implemented during the field study and the local elites and development practitioners responded to the research with the expectation of probably more incoming projects.

A second limitation lies in conducting appropriate professionals and academics to collect expert opinions on local realities of disaster vulnerability in rural Bangladesh in the context of climate change. The study identified the language gap between communities and experts. As previously stated in Chapter 4, the application of multiple methods in a non-regimented and pragmatic way helped to more appropriately address the overall aims and objectives of the study, also serving to reinforce validity and reliability.

Despite some limitations it is anticipated that the dissemination of the research findings back to the respondents of the study areas, policy-makers and development

professionals will be able to inform present and future DRR and CCA strategies in Bangladesh.

9.6 Concluding remarks

The study extends understanding of DRR as an adaptation strategy in rural Bangladesh through community engagement in local level external interventions and in doing so makes an original contribution to knowledge in different ways. Firstly, the research demonstrated the multiple dimension of social vulnerability to environmental disasters in climate change context. Secondly, the study explored traditional knowledge and practices of managing disaster risks at community level. Thirdly, appropriate and inappropriate external interventions were identified in reducing disaster vulnerability and in strengthening community capacity.

The findings derived from the thesis contribute towards a limited literature examining the similarities and dissimilarities between DRR and CCA in developing countries (Glantz, 2003; Sperling and Szekely, 2005; O'Brien et al. 2006a; Lewis, 2007; Christoplos et al., 2009; Warner, et. al., 2009; Mitchell et al., 2010). The findings of the previous studies focused the limited evidence there has been to provide an insight into communities' perspectives (Gero et al., 2011). Apart from some limitations and challenges in implementing existing DRR approaches in rural Bangladesh, the present study identified potential scenarios of mainstreaming an integrated DRR and CCA at local level through community engagement in external intervention with special reference of both flood and cyclone survivors.

Above all, the thesis presented an in-depth portrait of DRR as an adaptation strategy in Bangladesh. Given the acceptance level of traditional knowledge and practice of managing disaster risks it is likely that new CCA initiatives should be incorporated into existing DRR strategies. Although these DRR strategies and mechanisms assist communities to reduce present disaster vulnerability and enhance capacity to confront climate change impacts in the near future, this must not overlook the predicted uncertainties of long term climate impacts at community level and need for implementation of the wider range of CCA measures.

Appendices

Appendix 1 | Different government departments at Upazila level

Ministries and Departments	Designation of the executive head of the concerned office at Upazila level
Government departments under the direct supervision of Upazila Parishad	
Ministry of Public Administration (MoPA)	
1. Upazila Administration	Upazila Nirbahi (Executive) Officer (UNO) The Office of UNO
Ministry of Health and Family Welfare	
2. Directorate General of Health Services	Upazila Health Officer Upazila Health Complex
3. Directorate General of Family Planning	Upazila Family Panning Officer Upazila Family Planning Office (Non-clinical Part) Medical Officer Upazila Family Planning Office (Clinical Part)
Ministry of Agriculture (MoA)	
4.Department of Agricultural Extension (DAE)	Upazila Agricultural Officer (UAO) The Office of UAO
Ministry of Livestock and Fisheries	
5. Department of Livestock Services (DLS)	Upazila Livestock Officer (ULO) The Office of ULO
6. Directorate of Fisheries (DoF)	Upazila Fisheries Officer (UFO) The Office of UFO
Ministry of Local Government, Rural Development and Cooperatives (MoLGRD&C) **Local Goverment Division (LGD)**	
7. Local Government Engineering Department (LGED)	Upazila Engineer The Office of Upazila Engineer
8. Department of Public Health Engineering (DPHE)	Upazila Public Health Engineer (UPHE) The Office of UPHE
Ministry of Local Government, Rural Development and Co-operatives (MoLGRD&C) **Rural Development and Co-operative Division (RDCD)**	
9. Bangladesh Rural Development Board (BRDB)	Upazila Rural Development Officer (URDO) The Office of URDO
10. Department of Cooperatives	Upazila Cooperative Officer (UCO) The Office of UCO
Ministry of Education	
11. Directorate of Secondary and Higher Education	Upazila Secondary Education Officer (USEO) The Office of USEO
Ministry of Primary and Mass Education	
12. Directorate of Primary Education	Upazila Education Officer (UEO) The Office of UEO
Ministry of Youth and Sports	
13. Department of Youth Development	Upazila Youth Development Officer (UYDA) The Office of UYDO
Ministry of Women and Children Affairs	
14. Department of Women Affairs	Upazila Women Affair Officer (UWAO) The Office of UWAO

Ministries and Departments	Designation of the executive head of the concerned office at Upazila level
Ministry of Social Welfare	
15. Department of Social Services (DSS)	Upazila Social Service Officer (USSO) The Office of USSO
Ministry of Environment and Forests	
16. Bangladesh Forest Department	Forest Officer Upazila Office for Social Forestry
Ministry of Disaster Management and Relief	
17. Department of Disaster Management (DDM)	Project Implementation Officer (PIO) The Office of PIO
Other departments at Upazila level directly controlled by the government (GoB)	
Ministry of Land	
1. Land Reforms Board	Assistant Commissioner (Land) Upazila Land Office
2. Land Record and Survey Department	Upazila Settlement Officer Upazila Settlement Office
Ministry of Home Affairs	
3. Bangladesh Police	Officer-in-Charge (OC) Thana (Police Station)
4. Department of Ansar and VDP	Upazila Ansar and VDP Officer Upazila Office of Ansar and VDP
5. Department of Fire Service and Civil Defence	Deputy Assistant Director Upazila Fire Service and Civil Defence Station
Ministry of Finance **Finance Division**	
6. Office of Controller General of Accounts	Upazila Account Officer The Office of Upazila Account Officer
Ministry of Law, Justice and Parliamentary Affairs **Law and Justice Division**	
7. Directorate of Registration	Sub-Registrar The Office of Sub-Registrar
Ministry of Planning **Statistics and Informatics Division**	
8. Bangladesh Bureau of Statistics (BBS)	Upazila Statistic Officer (USO) The Office of USO
Ministry of Food	
9. Directorate General of Food	Upazila Food Controller (UFC) The Office of UFC
Ministry of Posts, Telecommunications and Information Technology **Posts and Telecommunications Division**	
10. Bangladesh Post Office	Post Master Upazila Post Office
Election Commission, Bangladesh (a statutory body but not part of the government)	
11. Secretariat of Election Commission, Bangladesh	Upazila Election Officer The Office of Upazila Election Officer

(Source: Author)

Appendix 2 | List of universities and research institutes in Bangladesh and their academic programmes and activities addressing disaster management and climate change issues

Universities and research institutes	Establishment	Programmes and activities
Public universities		
University of Dhaka	**1921**	
Department of Economics	1921	MSc, MPhil, PhD & Research
Department of Political Science	1938	MSc, MPhil, PhD & Research
Department of Geography and Environment	1948	MSc, MPhil, PhD & Research
Department of Sociology	1957	MSc, MPhil, PhD & Research
Department of Anthropology	1992	MSc, MPhil, PhD & Research
Disaster Research, Training and Management Centre (DRTMC)	-	Research & Training
Refugee and Migratory Movements Research Unit (RMMRU)		Research & Training
Institute of Disaster Management and Vulnerability Studies	2012	Bachelor, PGD & MSc
Department of Disaster Science and Management	2014	Bachelor, PGD & MSc
Center for Climate Change Study and Resource Utilization (CCCSRU)	2014	Research & Training
University of Rajshahi	**1953**	
Department of Economics	1954	MSc, MPhil, PhD & Research
Department of Geography and Environmental Studies	1955	MSc, MPhil, PhD & Research
Department of Political Science	1963	MSc, MPhil, PhD & Research
Department of Sociology	1970	MSc, MPhil, PhD & Research
Institute of Environmental Studies (IES)	2010	PGDDM, MPhil, PhD & Research
Bangladesh Agricultural University (BAU), Mymensingh (1961)		
Department of Agricultural Extension Education	-	MSc, MPhil, PhD & Research
Department of Soil Science	-	MSc, MPhil, PhD & Research
Department of Environmental Science	-	MSc, MPhil, PhD & Research
Bangladesh University of Engineering and Technology (BUET), Dhaka (1962)		
Department of Water Resources Engineering	-	MSc, MPhil, PhD & Research
Institute of Water and Flood Management	1974	PGD, MSc, MPhil, PhD, Research & Training
BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS)	2011	Research & Training
University of Chittagong	**1966**	
Institute of Marine Sciences and Fisheries	1971	MSc, Research & Training
Department of Sociology	-	MSc, MPhil, PhD & Research
Department of Anthropology	-	MSc, MPhil, PhD & Research
Department of Geography and Environmental Studies	1996	MSc, MPhil, PhD & Research
Jahangirnagar University, Dhaka	**1970**	
Department of Geography and Environment	1970	MSc, MPhil, PhD & Research
Department of Economics	1970	MSc, MPhil, PhD & Research
Department of Anthropology	1985	MSc, MPhil, PhD & Research
Department of Government and Politics	-	MSc, MPhil, PhD & Research
Department of Environmental Sciences	1999	MSc, MPhil, PhD & Research

Universities and research institutes	Establishment	Programmes and activities
Shahjalal University of Science and Technology (SUST), Sylhet (1986)		
Department of Geography and Environment	2011	MSc, MPhil, PhD & Research
Khulna University	**1991**	
Environmental Science Discipline	-	MSc & Research
Urban and Rural Planning Discipline	-	MURP & Research
Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur (1998)		
Department of Agricultural Extension and Rural Development	1998	MSc, MPhil, PhD & Research
Department of Environmental Science	1998	MSc, MPhil, PhD & Research
Mawlana Bhashani Science and Technology University (MBSTU), Tangail (1999)		
Department of Environmental Science and Resource Management	2004	MSc & Research
Patuakhali Science and Technology University (PSTU) (2000)		
Faculty of Disaster Management	-	Bachelor
Department of Environmental Science		MSc & Research
Department of Disaster Risk Management		MSc & Research
Department of Emergency Management		MSc & Research
Department of Resource Management		MSc & Research
Department of Geo Information Science and Earth Observation		MSc & Research
Sher-e-Bangla Agricultural University, Dhaka	**2001**	
Department of Agroforestry and Environmental Science	-	MSc, MPhil, PhD & Research
Jagannath University, Dhaka	**2005**	
Department of Geography and Environment	2005	MSc & Research
Sylhet Agricultural University	**2006**	
Department of Agroforestry and Environmental Science		MSc & Research
Chittagong University of Engineering and Technology (CUET) 2003		
Department of Disaster and Environmental engineering	-	Bachelor, MSc & Research
Institute of Earthquake Engineering Research	2012	Research
Noakhali Science and Technology University (NSTU) (2006)		
Department of Environmental Science and Hazard studies	2014	Bachelor
Jessore University of Science and Technology	**2006**	
Department of Environmental Science and Technology	2008	MSc, MPhil, PhD & Research
Pabna University of Science and Technology	**2008**	
Department of Geography and Environment	-	Bachelor & Research

Universities and research institutes	Establishment	Programmes and activities
Begum Rokeya University, Rangpur	**2008**	
Department of Disaster Management	-	Bachelor, MSc & Research
Department of Geography and Environmental Science	-	Bachelor, MSc & Research
Bangladesh University of Professionals (BUP), Dhaka (2008)		
Disaster and Human Security Management	-	MSc, MPhil, PhD & Research
Private universities		
North South University (NSU), Dhaka	**1992**	
Department of Environmental Science and Management	1994	Bachelor, MSc & Research
International University of Business Agriculture and Technology (IUBAT), Dhaka (1992)		
South Asian Disaster Management Center (SADMC)	-	Research
Independent University Bangladesh (IUB), Dhaka (1993)		
Department of Environmental Science	1993	Bachelor, MSc & Research
Department of Environmental Management	1993	Bachelor, MSc & Research
International Centre for Climate Change and Development (ICCCAD)	-	Training & Research
Central Women's University, Dhaka	**1993**	
Department of Geography and Environmental Studies	1993	Bachelor & MSc
BRAC University, Dhaka	**2001**	
Department of Architecture	-	MDM & Research
Stamford University Bangladesh, Dhaka	**2002**	
Department of Environmental Science	-	Bachelor, MSc & Research
Daffodil International University, Dhaka	**2002**	
Department of Environmental Science and Disaster Management	-	Bachelor, MSc & Research
State University of Bangladesh, Dhaka	**2002**	
Department of Environmental Science	-	MSc & Research
Research institutes (both government and autonomous)		
Bangladesh Meteorological Department (BMD), Dhaka	1947	Research
Bangladesh Forest Research Institute (BFRI), Chittagong	1955	Research
Bangladesh Institute of Development Studies (BIDS), Dhaka	1957	Research
Bangladesh Rural Development Academy (BARD), Comilla	1958	Training & Research
Bangladesh Water Development Board (BWDB), Dhaka	1959	Research

Universities and research institutes	Establishment	Programmes and activities
Bangladesh Rice Research Institute (BRRI), Gazipur	1970	Research
Bangladesh Space Research and Remote Sensing Organization (SPARRSO), Dhaka	1972	Research
Bangladesh Agricultural Research Council (BARC), Dhaka	1973	Research
Rural Development Academy (RDA), Bogra	1974	Training & Research
Bangladesh Agricultural Research Institute (BARI), Gazipur	1976	Research
Housing and Building Research Institute, Dhaka	1976	Research
River Research Institute, Faridpur	1977	Research
Water Resources Planning Organization (WARPO), Dhaka	1983	Research
Bangladesh Fisheries Research Institute, Mymensingh	-	Research
Institute of Water Modelling (IWM), Dhaka	1996	Research
Center for Environmental and Geographical Information Services (CEGIS), Dhaka	2002	Research
Department of Environment	-	
Climate Change Cell, Dhaka	2004	Research
Department of Disaster Management (DDM), Dhaka	2012	Training & Research
Research based NGOs		
International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), Dhaka	1960	Research
BRAC, Dhaka	1972	
Research and Evaluation Division (RED)	-	Research
Disaster Management and Climate Change Division	-	Training & Research
Rangpur Dinajpur Rural Services (RDRS)	1972	
North Bengal Instutite (NBI), Rangpur	-	Research
Bangladesh Centre for Advanced Studies (BCAS), Dhaka	-	Research
Bangladesh Disaster Preparedness Center (BDPC), Dhaka	1992	Research

(Source: Author)

Appendix3: Table of transect walk at Bonna village

Issues					
Land-type	*Nichu jamee* **(Lowlands)**	*Majhari & ucha jamee* **(Mid- and highlands)**	*Khal & Nama* **(Canals & dry canals)**	*Kashbon* **(Wild sugarcane)** (*Saccharum spontaneum*)	*Baluchar* **(Sandbars)**
Soils	*Bele doash* (Sandy loam)	*Bele doash* (Sandy loam)	*Doash* (Loamy soil)	*Bele doash* (Sandy Loam)	*Balu* (Sand)
Land-use	Agriculture Fallowland Graveyard Grazing land	Settlements, homestead gardens, ditches, mosques, *Eidgah*, school, market place, shops, looms	Fisheries Agricuture Fallowland	Agriculture Fallowland Grazing land	Fallowland Submersed lands
Productions	- Rice (Amon &Aaush) - Jute - Pulses - Potato - Sweat potato - Chili - Onion - *Dhaincha* (green manure crop) *(Sesbania aculeata)* - Vegetables (red amaranth, green amaranth, spinach, snake gourd, bottle gourd, pumpkin, brinjal, colocasia)	- Poultry - Dairy - Goatry - Fisheries - fruit & timber tress (Mango, jujube, jackfruit, guava, blackberry, bamboo, eucalyptus, acacia)	<u>Fish</u> - *Mrigal carp* - *Rohu* - *Catla* - *Barb* <u>Crop</u> - Boro rice	-Kasha/ Kashful (wild sugarcane) - Dhaincha	-
Flood Duration	3-4 months	1-2 months	6-7 months	3-4 months	6-7 months
Resources	-	Bicycles, boats, tube-wells, solar panels, looms, cows, goats, lambs, swans, hens, cocks, and fruit & timber trees	-	-	-

Issues	Lowlands	Mid- and highlands	Canals and dry canals	Wild sugarcane	Sandbars
Population	-	Families - 370 (approximate)	-	-	-
Problems	- Flood - Irrigation	- Road network - Flood - Food Security - Land ownership (demand for legal documents RS) - Dowry - Education - Health	- Dry - Co-operatives	-	-
Probable Solutions	- Pump Machine - Govt. and NGOs	- School - Flood shelter - Graveyard and home plinth raising - RS Map - Health centre - Road	- Canal digging	-	-
Education Status	-	- School (private)	-	-	-
Health Status	-	- No health centre or doctor - Midwife	-	-	-

(Prepared by: Author and his research team during fieldwork at Bonna village, March–May 2012)

Appendix 4 | Table of wellbeing analysis of the char-dwellers at Bonna village

Criteria	Well-off	Middle	Poor	Extreme poor
Cultivated land	20-30 *bighas* (8-12 acres)	6-15 *bighas* (2.5-6 acres)	2-5 *bighas* (less than 2.5 acres)	No cultivated land
Household type	Tin (corrugated sheet) made house	Tin & straw made house	Tin-shed roof and straw made wall	Straw made home but not well prepared
Occupation	- large business - Service - Farming - Cattle rearing	- Small business - Cultivation - Boatman	- Day labourer - Weaver	- Day labourer - Beggar - Disabled person - Widow
Boat	Often they have own boat	Some of them have	A few families have own boat	None of them have own boat
Number of bedrooms	4-5 rooms	2-3 rooms	1-2 rooms	1 room
Number of livestock	8-10 cows and 5-10 goats	5-7 cows and 2-5 goats	1-2 cows and 1-2 goats	None
Tube well and sanitary latrine	All of them have own facilities	Some of them	Rarely	None
Education	Literate to BA	Literate to SSC (Class X)	Literate to Class VIII	Illiterate
Number of households	15-20	80	150	20-25

Prepared by:

1. Mrs Shahnaz
2. Ms Shahida
3. Ms Chaina
4. Ms Kajoli
5. Mrs Salma Jahan (Shilpi)
6. Ms Meena
7. Ms Shirin
8. Mrs Sharifon
9. Mr Jalil
10. Mr Ismail
11. Mr Alam
12. Mr Farhad
13. Mr Fazlu
14. Mr Aufela
15. Ms Majida
16. Mrs Jahanara
17. Mrs Sazeda

Facilitated by: Author and his research team during the fieldwork at Bonna village, March–May 2012

Appendix 5 | The questionnaire used at Sidr village (in Bangla)

পল্লী উন্নয়ন একাডেমী (আরডিএ), বগুড়া এবং নর্থাম্ব্রিয়া ইউনিভার্সিটি, যুক্তরাজ্য

ঘূর্ণিঝড়ে পূর্ব-প্রস্তুতি ও প্রতিক্রিয়া: সাইক্লোন সিডর ও আইলা'র অভিজ্ঞতা

প্রশ্নমালা নম্বর ঃ					জরীপের তারিখ ঃ		০৫	২০১২

জেলা ঃ বরগুনা	উপজেলা ঃ পাথরঘাটা
ইউনিয়ন ঃ চর দুয়ানী	গ্রাম ঃ
বসতবাড়ির নম্বর/ আইডি ঃ	

A. HOUSEHOLD INFORMATION

১. উত্তরদাতার নাম ঃ

২. পিতা/স্বামীর নাম ঃ .....

৩. পরিবারপ্রধানের নাম ঃ .....

৪. পরিবার প্রধানের সাথে সম্পর্ক ঃ .....

৫. পরিবারের ধরণ ঃ	একক পরিবার	বর্ধিত পরিবার	যৌথ পরিবার	
৬. পরিবারের আর্থিক অবস্থা ঃ	অবস্থাসম্পন্ন	মধ্যম	দরিদ্র	হত দরিদ্র

৭. ধর্ম ঃ	ইসলাম	হিন্দু	খ্রিস্টান	বৌদ্ধ	অন্যান্য ... ...

৮. পরিবারের সদস্যদের তথ্যাদি **(কোড ব্যবহার করুন)**

পরিবারের সদস্য	নাম	প্রধানের সাথে সম্পর্ক	লিঙ্গ	বয়স	বৈবাহিক অবস্থা	শিক্ষাগত যোগ্যতা	পেশা
সদস্য ১		০১ - প্রধান					
সদস্য ২							
সদস্য ৩							
সদস্য ৪							
সদস্য ৫							
সদস্য ৬							
সদস্য ৭							
সদস্য ৮							
সদস্য ৯							
সদস্য ১০							

কোড

প্রধানের সাথে সম্পক

০১. নিজে
০২. স্বামী/ স্ত্রী
০৩. পুত্র/ কন্যা
০৪. পিতা/ মাতা
০৫. ভাই/ বোন
০৬. চাচা/ চাচী
০৭. চাচাতো ভাই/ বোন
০৮. মেয়েজামাই/ পুত্রবধু
০৯. নাতী/ নাতনী
১০. শ্যালক/ শ্যালিকা
১১. শ্বশুড়/ শ্বাশুড়ী
১২. গৃহ পরিচারক/ পরিচারিকা
১৩. অন্যান্য (উল্লেখ করুন)

লিঙ্গ

০১. পুরুষ
০২. মহিলা

বৈবাহিক অবস্থা

০১. অবিবাহিত
০২. বিবাহিত
০৩. বিপত্নীক/ বিধবা
০৪. পৃথক
০৫. তালাকপ্রাপ্ত

শিক্ষাগত যোগ্যতা

০১. নিরক্ষর
০২. নামস্বাক্ষরকারী
০৩. শুধু পড়তে পারেন
০৪. পড়তে ও লিখতে পারেন
০৫. প্রাথমিক
০৬. মাধ্যমিক
০৭. এসএসসি পাশ
০৮. এইচএসসি পাশ
০৯. ডিগ্রীধারী
১০. স্নাতকোত্তর
১১. অপ্রাপ্তবয়স্ক
১২. অন্যান্য

পেশার কোড

০১. গৃহস্থালী কৃষক
০২. বর্গাচাষী
০৩. কৃষি মজুর
০৪. দিন মজুর (অকৃষি)
০৫. মৎস্যজীবি
০৬. পশুপালক
০৭. ব্যবসায়ী
০৮. সরকারি চাকুরীজীবি
০৯. বেসরকারি চাকুরীজীবি
১০. ভ্যান/ রিক্সা চালক
১১. বাস/ ট্রাক ড্রাইভার
১২. মাঝি
১৩. গৃহবধু
১৪. গৃহ পরিচারক/ পরিচারিকা
১৫. মেকানিক
১৬. গার্মেন্টস কর্মী
১৭. তাঁতী
১৮. ইমাম/ মুয়াজ্জিন
১৯. ডাক্তার
২০. কবিরাজ/ পল্লী চিকিৎসক
২১. ধাত্রী
২২. ছাত্র/ ছাত্রী
২৩. অবসরপ্রাপ্ত
২৪. বেকার
২৫. অপ্রাপ্তবয়স্ক
২৬. অন্যান্য (উল্লেখ করুন)

B. WOMEN VULNERABILITY TO CYCLONES

৯. সাইক্লোন (বন্যা) সংক্রান্ত মহিলাদের সাধারণ ঝুঁকিসমূহ কি কি?

ক্রমিক নং	ঝুঁকি	স্কোর					
১.	শারীরিকভাবে দূর্বল	১	২	৩	৪	৫	৬
২.	মানসিক চাপ ও ভয়	১	২	৩	৪	৫	৬
৩.	পরিধেয় পোশাক (যেমন - শাড়ী)	১	২	৩	৪	৫	৬
৪.	পারিবারিক সিদ্ধান্ত গ্রহণে অংশগ্রহণের সুযোগ	১	২	৩	৪	৫	৬
৫.	সমাজে সিদ্ধান্ত গ্রহণে অংশগ্রহণের সুযোগ না পাওয়া	১	২	৩	৪	৫	৬
৬.	সন্তানদের দায়-দায়িত্ব	১	২	৩	৪	৫	৬
৭.	গবাদি পশু ও হাঁস-মুরগী পালনের দায়-দায়িত্ব	১	২	৩	৪	৫	৬
৮.	বন্যা হওয়ার তথ্য না পাওয়া	১	২	৩	৪	৫	৬
৯.	সামাজিক কারনে	১	২	৩	৪	৫	৬
১০.	পুরুষদের অসহযোগিতা	১	২	৩	৪	৫	৬
১১.		১	২	৩	৪	৫	৬
১২.		১	২	৩	৪	৫	৬
১৩.							

১	২	৩	৪	৫	৬
একেবারেই গুরুত্বপূর্ণ নয়	অতি সামান্যই গুরুত্বপূর্ণ	সামান্য গুরুত্বপূর্ণ	মোটামোটি গুরুত্বপূর্ণ	ভাল গুরুত্বপূর্ণ	খুবই গুরুত্বপূর্ণ

B. PREPAREDNESS FOR CYCLONE SIDR

১০. বড় বন্যার সময়ের স্মৃতি আপনার মনে আছে কি? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৪০</u> এ চলে যান।)

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১১. আপনি কি **বড়** বন্যার পূর্ব সতর্কতা সংকেত পেয়েছিলেন কি? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ১৫</u> এ চলে যান।)

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১২. উত্তর **হাঁ** হলে, কিভাবে সতর্কতা সংকেত পেয়েছিলেন?

নিজেই ☐ সন্তান ☐ আত্নীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ স্থানীয় জনপ্রতিনিধি ☐

স্বামী ☐ টিভি/ রেডিও ☐ সরকারি ব্যক্তি ☐ এনজিও কর্মী ☐ অন্যান্য ..... ☐

১৩. আপনি কি এ পূর্ব সতর্কতা সংকেত বিশ্বাস করেছিলেন? হাঁ ☐ না ☐

(উত্তর হাঁ হলে প্রশ্ন নং ১৫ এ চলে যান।)

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১৪. উত্তর **না** করলে, কেন বিশ্বাস করেননি?

জোড়ালোভাবে বলেননি ☐ | এ রকম কথা প্রায় শোনা যায় ☐ | কয়েকদিন পূর্বেই এ রকম ভুল সংকেত দেয়া হয়েছিল ☐ | .... ☐

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১৫. আপনি কি কি করেছিলেন?

পরিকল্পনা করা ☐ | খাবার সংগ্রহ ☐ | কাপড়-চোপড় বেধেঁ ফেলা ☐ | সন্তানদের তৈরি করা ☐

স্বামীর সাথে কথা বলা ☐ | অন্যান্য মহিলাদের সাথে কথা বলা ☐ | প্রতিবেশীদের খোঁজ নেয়া ☐ | দূরের অবস্থিত আত্নীয়দের খোঁজ নেয়া ☐

মূল্যবান সামগ্রী লুকিয়ে রাখা ☐ | আশ্রয় কেন্দ্রে যাওয়া ☐ | .... ☐ | .... ☐

১৬. **বড়** বন্যার পূর্বে আপনি আপনার বাড়ীর জিনিসপত্র কি করেছিলেন?

	জিনিসপত্র	**পরিমাণ**	**কিভাবে সংরক্ষণ করেছিলেন?**	**কে সহযোগিতা করেছিলেন?**
১.	রান্না করা ভাত			
২.	রান্না করা তরকারি			
৩.	চাল			
৪.	ডাল			
৫.	পেঁয়াজ-মরিচ			
৬.	শাক-সবজি			
৭.	কাপড়-চোপড়			
৮.	অলংকারাদি			
৯.	রেডিও/টিভি			
১০.	সাইকেল/ ভ্যানরিক্সা/ নৌকা			
১১.	(বিয়ের) ছবি			
১২.	কুরআন শরীফ			
১৩.	ছাগল/ গরু			
১৪.	ঘাঁস-মুরগী			
১৫.	নগদ টাকা			
১৬.	খাওয়ার পানি			
১৭.	কেরোসিন			
১৮.	সন্তানদের বই-খাতা			
১৯.				

১৭. **বড়** বন্যার সময়ে আপনি কি পরেছিলেন?

শাড়ী ☐ শাড়ী-ব্লাউজ ☐ ম্যাক্সি ☐ সালোয়ার কামিজ ☐ অন্যান্য ..... ☐

১৮. **বড়** বন্যার পরে শাড়ী কি অবস্থায় পেয়েছিলেন?

শাড়ী শরীরেই ছিল ☐ শাড়ী খুলে গিয়েছিল ☐ খুঁজে পাননি ☐ অন্যান্য ..... ☐

E. RESPONSE TO CYCLONE SIDR

১৯. **বড়** বন্যার সময়ে আপনি কোথায় অবস্থান করেছিলেন?

নিজ বাড়ী ☐ প্রতিবেশীর বাড়ী ☐ আত্মীয়ের বাড়ী ☐ আশ্রয় কেন্দ্র ☐ অন্যান্য (.....) ☐

উত্তর **নিজ বাড়ী** হলে -

২০. নিজ বাড়ীতে কেন অবস্থান করেছিলেন?

বন্যা হবে না মনে করেছিলেন ☐ বন্যা হলেও কোন ক্ষতি হবে না ☐ জিনিসপত্র হেফাজত করার জন্য ☐ আশ্রয় কেন্দ্রে মহিলাদের সমস্যা ☐

আশ্রয় কেন্দ্র দূরে অবস্থিত ☐ স্বামী বাড়ীতে না থাকায় ☐ ..... ☐ ..... ☐

২১. তখন আপনার সাথে কে কে বাড়ীতে ছিলেন?

স্বামী ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী ☐ অন্যান্য ..... ☐

উত্তর **প্রতিবেশী/ আত্মীয়ের বাড়ী** হলে -

২২. প্রতিবেশী/ আত্মীয়ের বাড়ীতে কেন গিয়েছিলেন?

নিজের বাড়ী নিরাপদ নয় ☐ প্রতিবেশী/ আত্মীয়ের বাড়ী নিরাপদ ☐ বাড়ীতে স্বামী না থাকায় ☐ মহিলারা একত্রে থাকার জন্য ☐

আশ্রয় কেন্দ্র দূরে অবস্থিত ☐ ভয় পাওয়ার জন্য ☐ ..... ☐ ..... ☐

২৩. কার সাথে আপনি প্রতিবেশী/ আত্মীয়ের বাড়ীতে গিয়েছিলেন?

স্বামী ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ অন্যান্য ..... ☐

উত্তর **আশ্রয় কেন্দ্র** হলে -

২৪. আশ্রয় কেন্দ্রে কেন গিয়েছিলেন?

নিজের বাড়ী নিরাপদ নয় ☐	প্রতিবেশী/ আত্মীয়ের বাড়ী নিরাপদ নয় ☐	বাড়ীতে স্বামী না থাকায় ☐	মহিলারা একত্রে থাকার জন্য ☐
রিলিফ পাওয়ার আশায় ☐	ভয় পাওয়ার জন্য ☐	আশ্রয় কেন্দ্রে যাওয়ার জন্য মাইকিং করায় ☐	.... ☐

২৫. কার সাথে আপনি আশ্রয় কেন্দ্রে গিয়েছিলেন?

স্বামী ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ অন্যান্য ..... ☐

২৬. কে আপনাকে আশ্রয় কেন্দ্রে যাওয়ার বিষয়ে উৎসাহিত করেছিলেন?

নিজেই ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ স্থানীয় জনপ্রতিনিধি ☐

স্বামী ☐ টিভি/ রেডিও ☐ সরকারি ব্যক্তি ☐ এনজিও কর্মী ☐ অন্যান্য ..... ☐

২৭. আশ্রয় কেন্দ্রে আপনি কত সময় ছিলেন?

৬ ঘন্টার কম ☐ ৬-১২ ঘন্টা ☐ ১ দিন ☐ ২-৩ দিন ☐ ১ সপ্তাহ ☐ ১ সপ্তাহের বেশি ☐

২৮. আশ্রয় কেন্দ্রে আপনার কি কোন সমস্যা হয়েছিল? হাঁ ☐ না ☐

(উত্তর না হলে প্রশ্ন নং ৩০ এ চলে যান।)

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২৯. **হাঁ** হলে, কি কি সমস্যা হয়েছিল?

থাকার সমস্যা ☐	খাওয়ার সমস্যা ☐	টয়লেট সমস্যা ☐	গোসলের সমস্যা ☐
পর্দা রক্ষায় সমস্যা ☐	বখাটে লোকের উপদ্রুপ ☐	.... ☐	.... ☐

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৩০. **বড়** বন্যার সময়ে আপনি কি করছিলেন?

চুপচাপ বসে ছিলেন ☐	আল্লাহ্'কে স্মরণ করছিলেন ☐	বাচ্চাদের কাছে রেখেছিলেন ☐	খাওয়া-দাওয়া করেছিলেন ☐
ঘুমিয়ে ছিলেন ☐	.... ☐	.... ☐	.... ☐

৩১. বাতাস বা ঝড় কমে গেলে আপনি সর্বপ্রথম কি করেছিলেন?

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৩২. আপনি কি কোন রিলিফ পেয়েছিলেন কি? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৩৪</u> এ চলে যান।)

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৩৩. কি কি রিলিফ সামগ্রী পেয়েছিলেন?

চাল ☐ ডাল ☐ কেরোসিন ☐ তেল-লবণ ☐ পানি ☐ কাপড় ☐

দেয়াশলাই ☐ মোমবাতি ☐ চিড়া-গুড় ☐ বিস্কুট ☐ ..... ☐ ..... ☐

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৩৪. **আশ্রয় কেন্দ্রে** বা **আত্মীয়/ প্রতিবেশীর বাড়ীতে** থাকলে, বাড়ী ফিরে সর্বপ্রথম কি কাজ করলেন?

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.....

৩৫. আপনি কি আপনার কি কি ক্ষয়-ক্ষতি হয়েছে তার তালিকা তৈরি করেছিলেন? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৩৭</u> এ চলে যান।)

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৩৬. হাঁ হলে, আপনার কি কি ক্ষয়-ক্ষতি হয়েছিল?

	জিনিসপত্র	**পরিমাণ**	**কতটুকু ক্ষতি/ নষ্ট হয়েছিল?**
১.	চাল		
২.	বাড়ি ঘর		
৩.	ডাল		
৪.	কাপড়-চোপড়		
৫.	অলংকারাদি		
৬.	রেডিও/টিভি		
৭.	সাইকেল/ ভ্যানরিক্সা/ নৌকা		
৮.	(বিয়ের) ছবি		
৯.	কুরআন শরীফ		
১০.	ছাগল/ গরু		
১১.	হাঁস-মুরগী		
১২.	নগদ টাকা		
১৩.	সন্তানদের বই-খাতা		

১৪.			
১৫.			

৩৭. আপনি কি মনে করেন যে পূর্ব প্রস্তুতি নিলে এ ক্ষয়-ক্ষতি কম হত? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৩৯</u> এ চলে যান।)

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৩৮. উত্তর **হাঁ** হলে, কেন তাহলে পূর্ব প্রস্তুতি নেননি?

এমনই নেননি ☐ | সব আল্লাহ্'র উপর ছেড়ে দিয়েছিলেন ☐ | আপনার স্বামী করবে ভেবেছিলেন ☐ | স্বামী বললে করতেন ☐

প্রস্তুতির সময় পাননি ☐ | অন্য কেউ করেননি, তাই আপনিও করেননি ☐ | এতো ক্ষতি হবে ভাবেননি ☐ | .... ☐

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৩৯. উত্তর **না** হলে, কেন পূর্ব প্রস্তুতি নিলেও ক্ষয়-ক্ষতি কম হতো না?

আপনার ধারণা ☐ | বন্যা এতো বড় ছিল যে প্রস্তুতি নিলেও ক্ষতি হতো ☐ | .... ☐ | .... ☐

৪০. আপনি কি আপনার ক্ষতি হওয়া কোন সম্পদের মেরামত করেছিলেন? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৪২</u> এ চলে যান।)

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৪১. উত্তর হাঁ হলে, কি কি মেরামত করেছিলেন?

	জিনিসপত্র	**কিভাবে মেরামত করেছিলেন?**	**কে সহযোগিতা করেছিলেন?**
১.	বাড়ীর দেয়াল/ বেড়া		
২.	বাড়ীর ছাদ		
৩.	বাড়ীর ভিটা		
৪.	বাড়ীর প্রাচীর		
৫.	সবজির মাচা		
৬.			
৭.			
৮.			

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৪২. উত্তর **না** হলে, কেন করেননি?

এমনই করেননি ☐ | মানসিক অবস্থা ভাল ছিল না ☐ | আপনার স্বামী করবে ভেবেছিলেন ☐ | স্বামী বললে করতেন ☐

সময় পাননি ☐ | অন্য কেউ করেননি, তাই আপনিও করেননি ☐ | কাজ করার লোকের অভাব ছিল ☐ | রিলিফের লোক করবে বলে ভেবেছিলেন ☐

টাকার অভাবে করতে পারেননি ☐ | আপনাদের তেমন অসুবিধা হয়নি ☐ | ..... ☐ | ..... ☐

F. PREPAREDNESS FOR CYCLONE AILA

৪৩. **ছোট** বন্যার সময়ের স্মৃতি আপনার মনে আছে কি? হাঁ ☐ না ☐

(উত্তর না হলে তাঁকে ধন্যবাদ দিয়ে প্রশ্নোত্তর শেষ করুন।)

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৪৪. আপনি কি **ছোট** বন্যার পূর্ব সতর্কতা সংকেত পেয়েছিলেন কি? হাঁ ☐ না ☐

(উত্তর না হলে প্রশ্ন নং ৪৮ এ চলে যান।)

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৪৫. উত্তর **হাঁ** হলে, কিভাবে সতর্কতা সংকেত পেয়েছিলেন?

নিজেই ☐ | সন্তান ☐ | আত্মীয়-স্বজন ☐ | প্রতিবেশী মহিলা ☐ | স্থানীয় জনপ্রতিনিধি ☐

স্বামী ☐ | টিভি/ রেডিও ☐ | সরকারি ব্যক্তি ☐ | এনজিও কর্মী ☐ | অন্যান্য ..... ☐

৪৬. আপনি কি এ পূর্ব সতর্কতা সংকেত বিশ্বাস করেছিলেন? হাঁ ☐ না ☐

(উত্তর হাঁ হলে প্রশ্ন নং ৪৮ এ চলে যান।)

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৪৭. উত্তর **না** করলে, কেন বিশ্বাস করেননি?

জোড়ালোভাবে বলেননি ☐ | এ রকম কথা প্রায় শোনা যায় ☐ | কয়েকদিন পূর্বেই এ রকম ভুল সংকেত দেয়া হয়েছিল ☐ | ..... ☐

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৪৮. আপনি কি কি করেছিলেন?

পরিকল্পনা করা ☐ | খাবার সংগ্রহ ☐ | কাপড়-চোপড় বেধেঁ ফেলা ☐ | সন্তানদের তৈরি করা ☐

স্বামীর সাথে কথা বলা ☐ | অন্যান্য মহিলাদের সাথে কথা বলা ☐ | প্রতিবেশীদের খোঁজ নেয়া ☐ | দূরের অবস্থিত আত্মীয়দের খোঁজ নেয়া ☐

মূল্যবান সামগ্রী লুকিয়ে রাখা ☐ | আশ্রয় কেন্দ্রে যাওয়া ☐ | ..... ☐ | ..... ☐

৪৯. **ছোট** বন্যার পূর্বে আপনি আপনার বাড়ীর জিনিসপত্র কি করেছিলেন?

	জিনিসপত্র	পরিমাণ	কিভাবে সংরক্ষণ করেছিলেন?	কে সহযোগিতা করেছিলেন?
১.	রান্না করা ভাত			
২.	রান্না করা তরকারি			
৩.	চাল			

	জিনিসপত্র	পরিমাণ	কিভাবে সংরক্ষণ করেছিলেন?	কে সহযোগিতা করেছিলেন?
৪.	ডাল			
৫.	পেঁয়াজ-মরিচ			
৬.	শাক-সবজি			
৭.	কাপড়-চোপড়			
৮.	অলংকারাদি			
৯.	রেডিও/ টিভি			
১০.	সাইকেল/ ভ্যানরিক্সা/ নৌকা			
১১.	(বিয়ের) ছবি			
১২.	কুরআন শরীফ			
১৩.	ছাগল/ গরু			
১৪.	হাঁস-মুরগী			
১৫.	নগদ টাকা			
১৬.	খাওয়ার পানি			
১৭.	কেরোসিন			
১৮.	সন্তানদের বই-খাতা			
১৯.				
২০.				

৫০. **ছোট** বন্যার সময়ে আপনি কি পরেছিলেন?

শাড়ী ☐ শাড়ী-ব্লাউজ ☐ ম্যাক্সি ☐ সালোয়ার কামিজ ☐ অন্যান্য ..... ☐

৫১. **ছোট** বন্যার পরে শাড়ী কি অবস্থায় পেয়েছিলেন?

শাড়ী শরীরেই ছিল ☐ শাড়ী খুলে গিয়েছিল ☐ খুঁজে পাননি ☐ অন্যান্য ..... ☐

G. RESPONSE TO CYCLONE AILA

৫২. **ছোট** বন্যার সময়ে আপনি কোথায় অবস্থান করেছিলেন?

নিজ বাড়ী ☐ প্রতিবেশীর বাড়ী ☐ আত্নীয়ের বাড়ী ☐ আশ্রয় কেন্দ্র ☐ অন্যান্য (.....) ☐

উত্তর **নিজ বাড়ী** হলে -

৫৩. নিজ বাড়ীতে কেন অবস্থান করেছিলেন?

বন্যা হবে না মনে করেছিলেন ☐ বন্যা হলেও কোন ক্ষতি হবে না ☐ জিনিসপত্র হেফাজত করার জন্য ☐ আশ্রয় কেন্দ্রে মহিলাদের সমস্যা ☐

আশ্রয় কেন্দ্র দূরে অবস্থিত ☐ স্বামী বাড়ীতে না থাকায় ☐ .... ☐ .... ☐

৫৪. তখন আপনার সাথে কে কে বাড়ীতে ছিলেন?

স্বামী ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী ☐ অন্যান্য ..... ☐

উত্তর **প্রতিবেশী/ আত্মীয়ের বাড়ী** হলে -

৫৫. প্রতিবেশী/ আত্মীয়ের বাড়ীতে কেন গিয়েছিলেন?

নিজের বাড়ী নিরাপদ নয় ☐ | প্রতিবেশী/ আত্মীয়ের বাড়ী নিরাপদ ☐ | বাড়ীতে স্বামী না থাকায় ☐ | মহিলারা একত্রে থাকার জন্য ☐

আশ্রয় কেন্দ্র দূরে অবস্থিত ☐ | ভয় পাওয়ার জন্য ☐ | .... ☐ | .... ☐

৫৬. কার সাথে আপনি প্রতিবেশী/ আত্মীয়ের বাড়ীতে গিয়েছিলেন?

স্বামী ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ অন্যান্য ..... ☐

উত্তর **আশ্রয় কেন্দ্র** হলে -

৫৭. আশ্রয় কেন্দ্রে কেন গিয়েছিলেন?

নিজের বাড়ী নিরাপদ নয় ☐ | প্রতিবেশী/ আত্মীয়ের বাড়ী নিরাপদ নয় ☐ | বাড়ীতে স্বামী না থাকায় ☐ | মহিলারা একত্রে থাকার জন্য ☐

রিলিফ পাওয়ার আশায় ☐ | ভয় পাওয়ার জন্য ☐ | আশ্রয় কেন্দ্রে যাওয়ার জন্য মাইকিং করায় ☐ | .... ☐

৫৮. কার সাথে আপনি আশ্রয় কেন্দ্রে গিয়েছিলেন?

স্বামী ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ অন্যান্য ..... ☐

৫৯. কে আপনাকে আশ্রয় কেন্দ্রে যাওয়ার বিষয়ে উৎসাহিত করেছিলেন?

নিজেই ☐ সন্তান ☐ আত্মীয়-স্বজন ☐ প্রতিবেশী মহিলা ☐ স্থানীয় জনপ্রতিনিধি ☐

স্বামী ☐ টিভি/ রেডিও ☐ সরকারি ব্যক্তি ☐ এনজিও কর্মী ☐ অন্যান্য ..... ☐

৬০. আশ্রয় কেন্দ্রে আপনি কত সময় ছিলেন?

৬ ঘন্টার কম ☐ | ৬-১২ ঘন্টা ☐ | ১ দিন ☐ | ২-৩ দিন ☐ | ১ সপ্তাহ ☐ | ১ সপ্তাহের বেশি ☐

৬১. আশ্রয় কেন্দ্রে আপনার কি কোন সমস্যা হয়েছিল? হাঁ ☐ না ☐

(উত্তর না হলে প্রশ্ন নং ৬৩ এ চলে যান।)

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৬২. **হাঁ** হলে, কি কি সমস্যা হয়েছিল?

থাকার সমস্যা ☐	খাওয়ার সমস্যা ☐	টয়লেট সমস্যা ☐	গোসলের সমস্যা ☐
পর্দা রক্ষায় সমস্যা ☐	বখাটে লোকের উপদ্রুপ ☐	.... ☐	.... ☐

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৬৩. **ছোট** বন্যার সময়ে আপনি কি করছিলেন?

চুপচাপ বসে ছিলেন ☐	আল্লাহ্'কে স্মরণ করছিলেন ☐	বাচ্চাদের কাছে রেখেছিলেন ☐	খাওয়া-দাওয়া করেছিলেন ☐
ঘুমিয়ে ছিলেন ☐	.... ☐	.... ☐	.... ☐

৬৪. বাতাস বা ঝড় কমে গেলে আপনি সর্বপ্রথম কি করেছিলেন?

.....

.....

৬৫. আশ্রয় কেন্দ্রে থাকার সময়ে কি রিলিফ পেয়েছিলেন কি? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৬৭</u> এ চলে যান।)

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৬৬. কি কি রিলিফ সামগ্রী পেয়েছিলেন?

চাল ☐	ডাল ☐	কেরোসিন ☐	তেল-লবণ ☐	পানি ☐	কাপড় ☐
দেয়াশলাই ☐	মোমবাতি ☐	চিড়া-গুড় ☐	বিস্কুট ☐	..... ☐	..... ☐

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৬৭. **আশ্রয় কেন্দ্রে** বা **আত্নীয়/ প্রতিবেশীর বাড়ীতে** থাকলে, বাড়ী ফিরে সর্বপ্রথম কি কাজ করলেন?

.....

.....

৬৮. আপনি কি আপনার কি কি ক্ষয়-ক্ষতি হয়েছে তার তালিকা তৈরি করেছিলেন কি? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৭০</u> এ চলে যান।)

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৬৯. হাঁ হলে, আপনার কি কি ক্ষয়-ক্ষতি হয়েছিল?

	জিনিসপত্র	**পরিমাণ**	**কতটুকু ক্ষতি/ নষ্ট হয়েছিল?**
১.	চাল		
২.	ডাল		
৩.	কাপড়-চোপড়		
৪.	অলংকারাদি		

	জিনিসপত্র	পরিমাণ	কতটুকু ক্ষতি/ নষ্ট হয়েছিল?
৫.	রেডিও/টিভি		
৬.	সাইকেল/ ভ্যানরিক্সা/ নৌকা		
৭.	(বিয়ের) ছবি		
৮.	কুরআন শরীফ		
৯.	ছাগল/ গরু		
১০.	হাঁস-মুরগী		
১১.	নগদ টাকা		
১২.	সন্তানদের বই-খাতা		
১৩.			
১৪.			
১৫.			

৭০. আপনি কি মনে করেন যে পূর্ব প্রস্তুতি নিলে এ ক্ষয়-ক্ষতি কম হত? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৭২</u> এ চলে যান।)

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৭১. উত্তর **হাঁ** হলে, কেন তাহলে পূর্ব প্রস্তুতি নেননি?

এমনই নেননি ☐ | সব আল্লাহ্'র উপর ছেড়ে দিয়েছিলেন ☐ | আপনার স্বামী করবে ভেবেছিলেন ☐ | স্বামী বললে করতেন ☐

প্রস্তুতির সময় পাননি ☐ | অন্য কেউ করেননি, তাই আপনিও করেননি ☐ | এতো ক্ষতি হবে ভাবেননি ☐ | .... ☐

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৭২. উত্তর **না** হলে, কেন পূর্ব প্রস্তুতি নিলেও ক্ষয়-ক্ষতি কম হতো না?

আপনার ধারণা ☐ | বন্যা এতো বড় ছিল যে প্রস্তুতি নিলেও ক্ষতি হতো ☐ | .... ☐ | .... ☐

৭৩. আপনি কি আপনার ক্ষতি হওয়া কোন সম্পদের মেরামত করেছিলেন? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৭৫</u> এ চলে যান।)

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৭৪. উত্তর হাঁ হলে, কি কি মেরামত করেছিলেন?

	জিনিসপত্র	কিভাবে মেরামত করেছিলেন?	কে সহযোগিতা করেছিলেন?
১.	বাড়ীর দেয়াল/ বেড়া		
২.	বাড়ীর ছাদ		
৩.	বাড়ীর ভিটা		

	জিনিসপত্র	কিভাবে মেরামত করেছিলেন?	কে সহযোগিতা করেছিলেন?
৪.	বাড়ীর প্রাচীর		
৫.	সবজির মাচা		
৬.			
৭.			

৭৫. উত্তর **না** হলে, কেন করেননি?

এমনই করেননি	☐	মানসিক অবস্থা ভাল ছিল না	☐	আপনার স্বামী করবে ভেবেছিলেন	☐	স্বামী বললে করতেন	☐
সময় পাননি	☐	অন্য কেউ করেননি, তাই আপনিও করেননি	☐	কাজ করার লোকের অভাব ছিল	☐	রিলিফের লোক করবে বলে ভেবেছিলেন	☐
টাকার অভাবে করতে পারেননি	☐	আপনাদের তেমন অসুবিধা হয়নি	☐	....	☐	....	☐

৭৬. আপনি কি **বড় বন্যার** সময়ের অভিজ্ঞতা **ছোট বন্যার** সময়ে কাজে লাগিয়েছিলেন? হাঁ ☐ না ☐

(উত্তর <u>না</u> হলে <u>প্রশ্ন নং ৭২</u> এ চলে যান।)

৭৭. উত্তর **হাঁ** হলে, কিভাবে কাজে লাগিয়েছিলেন ?

পূর্ব প্রস্তুতি নেয়া	☐	পূর্ব সতর্কতা সংকেত বিশ্বাস করা	☐	অন্যদের সতর্ক করা	☐	আশ্রয় কেন্দ্রে যাওয়া	☐	প্রয়োজনীয় জিনিসপত্র সংরক্ষণ করা	☐
প্রতিক্রিয়া	☐	ক্ষয়-ক্ষতির হিসাব করা	☐	উদ্ধার কাজে অংশ নেয়া	☐	জরুরী সম্পদের মেরামত করা	☐	অন্যান্য	☐

৭৮. ভবিষ্যতে কোন বড় বন্যা হলে এ দুই বন্যার অভিজ্ঞতা কাজে লাগাতে পারবেন বলে কি মনে করেন ? হাঁ ☐ না ☐

৭৯. উত্তর **না** হলে, কেন লাগাতে পারবেন না বলে আপনি মনে করেন ?

আপনার ধারণা, কিন্তু কারণ আপনার জানা নেই	☐	অভাবের জন্য	☐	সরকার সাহায্য করে না তাই	☐	আল্লাহ্ গজবের বিরুদ্ধে প্রস্তুতি নিয়ে কিছুই করা যাবে না	☐
ধনী লোকেরা সাহায্য করে না	☐	আমাদের নিজেদের দোষ	☐	বন্যার গতিধারা বোঝা সম্ভব না	☐	....	☐

৮০. নোট (প্রয়োজনে)

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তথ্য সংগ্রহকারীর স্বাক্ষর গবেষক/ তত্ত্বাবধায়কের স্বাক্ষর

উত্তরদাতাকে ধন্যবাদ দিয়ে শেষ করুন।

Appendix 6 | the questionnaire used at Sidr village (in English)

Rural Development Academy (RDA), Bogra and Northumbria University, UK

Cyclone Preparedness and Response: Experiences of Cyclone Sidr and Aila

Questionnaire No.					Date of interview:		05	2012

District: Barguna	Upazila: Patharghata
Union: Char Dunani	Village:
House No.	

A. HOUSEHOLD INFORMATION

1. Name of the respondent: .....
2. Name of father/ husband: .....
3. Name of the family head: .....
4. Relationship with family head: (please use the appropriate code)

5. Family structure:	Nuclear family	Extended family	Joint family
6. Economic condition:	Well-off	Middle class	Poor	Extreme poor

7. Religion:	Muslim	Hindu	Christian	Buddhist	Others ... ...

8. Information on family members (please use the appropriate codes)

Family members	Name	Relationship with the head	Sex	Age	Marital status	Educational status	Occupation
Member 1		01 - head					
Member 2							
Member 3							
Member 4							
Member 5							
Member 6							
Member 7							
Member 8							
Member 9							
Member10							

Codes

Relationship with the head	**Sex**	**Educational status**
01. Himself or herself 02. Husband/wife 03. Son/daughter 04. Parents 05. Brother/sister 06. Uncle/aunt 07. Cousin 08. Son/daughter-in-law 09. Grandson/ granddaughter 10. Brother/sister-in-law 11. Father/mother-in-law 12. Servant/maid 13. Others (please specify)	01. Male 02. Female **Marital status** 01. Single 02. Married 03. Widow 04. Separated 05. Divorcee	01. Illiterate 02. Only can sign 03. Only can read 04. Can read & write 05. Primary 06. Secondary 07. SSC exam (GCSE) 08. HSC exam (A level) 09. Graduate 10. Postgraduate 11. Minor 12. Others

Occupational codes:

01. Farmer 02. Sharecropper 03. Wage worker (agriculture.) 04. Wage worker (non-farm) 05. Fisherman 06. Ranger	07. Businessman 08. Govt. service 09. Private service 10. Van/rickshaw-puller 11. Bus/truck driver 12. Boatman 13. Home maker	14. Servant/maid 15. Mechanic 16. Garment worker 17. Hand loom waver 18. Imam/ *muajjin* (caller for prayers) 19. Doctor (GP)	20. village doctor 21. Midwife 22. Student 23. Pensioner 24. Jobseeker 25. Minor 26. Others (please specify)

B. COMMUNITY VULNERABILITY TO CYCLONES

9. Vulnerability of local people to cyclones

Sl. No.	Risks	Scores					
1.	Physical weakness	1	2	3	4	5	6
2.	Psychological pressure and panic	1	2	3	4	5	6
3.	Traditional dress (e.g. Shari)	1	2	3	4	5	6
4.	Poor participation in family level decision-making processes	1	2	3	4	5	6
5.	Poor participation in community level decision-making processes	1	2	3	4	5	6
6.	Division of labour (e.g. child-care)	1	2	3	4	5	6
7.	Division of labour (e.g. livestock)	1	2	3	4	5	6
8.	Poor access to cyclone related information	1	2	3	4	5	6
9.	Socio-cultural constraints	1	2	3	4	5	6

Sl. No.	Risks	Scores					
10.	Poor cooperation from male counterpart	1	2	3	4	5	6
11.		1	2	3	4	5	6
12.		1	2	3	4	5	6
13.		1	2	3	4	5	6

1	2	3	4	5	6
No importance at all	Least important	Less important	Moderately important	Important	Very important

B. PREPAREDNESS FOR CYCLONE SIDR

10. Did you observe the impacts of cyclone **Sidr**? Yes ☐ No ☐

(If the answer **No**, please move to the question **40**)

11. Did you receive any early warning before **Sidr**? Yes ☐ No ☐

(If the answer **No**, please move to the question **15**)

12. If the answer **Yes**, whom did you receive the early warning?

Yourself ☐ Child ☐ Relative ☐ Neighbour ☐ Local leader ☐

pouse ☐ TV/radio ☐ CPP volunteer ☐ NGO staff ☐ Other ..... ☐

13. Did you believe the early warning? Yes ☐ No ☐

(If the answer **Yes**, please move to the question 15)

14. If the answer is No, why didn't you believe the warning?

Didn't disseminate strongly ☐ Early warnings of this type often disseminated ☐ A false warning was disseminated a few days ago ☐ .... ☐

15. What did you do after listening the cyclone warning?

Planning ☐ Food storage ☐ Store cloths ☐ Keep children with them ☐

Consult with partner ☐ Consult with other family members ☐ Look after neighbours ☐ Look after distant relatives ☐

Hide valuable assets ☐ Move to a cyclone shelter ☐ .... ☐ .... ☐

16. How did you preserve your assets before **Sidr**?

	Assets	**Amount**	**How did you preseve these?**	**Whom did you help to do so?**
1.	Steamed rice			
2.	Curry			
3.	Paddy rice			
4.	Pulse			
5.	Onions & chiliies			
6.	Vegetable			
7.	Cloths			
8.	Ornaments			
9.	Radio/TV			
10.	Bicycle/van-rickshaw/boat			
11.	Marriage photos			
12.	Relious books			
13.	Livestock			
14.	Poultry			
15.	Cash money			
16.	Drinking water			
17.	Kerocene			
18.	Children's books			
19.				
20.				
21.				

17. What did you wear during **Sidr**? (only for the female participants)

Shari ☐ Shari & blouse ☐ Long dress ☐ Salwer & kamiz ☐ Other ..... ☐

18. What was your clothing condition after **Sidr**? (in the case of Shari)

It was on your body ☐ It was seperated from your body ☐ You lost your Shari ☐ Other .... ☐

E. RESPONSE TO CYCLONE SIDR

19. Where did you stay during **Sidr**?

Own house ☐ Neighbour's house ☐ Relative's house ☐ Cyclone shelter ☐ Other (.....) ☐

If the answer is **Own house**:

20. Why did you stay in your own house?

Didn't think that Sidr would actually happen ☐ Didn't think that Sidr would bring such volume of loss and damage ☐ To protect assets ☐ Shelter condition was not up to the mark ☐

Location of shelter ☐ Absense of husband ☐ .... ☐ .... ☐

21. Whom did you stay with in that time?

Spouse ☐ Children ☐ Relatives ☐ Neighbours ☐ Others ..... ☐

If the answer is **Relative or neighbour's house**:

22. Why did you stay in your relative or neighbour's house?

Own house was unsafe ☐ That house was safe ☐ Absesnse of husband at home ☐ To stay together ☐

Distance of shelter ☐ Scared at own house ☐ .... ☐ .... ☐

23. Whom did you go with you?

Spouse ☐ Children ☐ Relatives ☐ Neighbours ☐ Others ..... ☐

If the answer is **Cyclone shalter**:

24. Why did you go to the shelter?

Own house was unsafe ☐ Relative/ neighbour's house was unsafe too ☐ Absesnse of husband at home ☐ Stay together ☐

For relief assistance ☐ Scared at own house ☐ Motivated by the EW dissemination ☐ .... ☐

25. With whom did you go you?

Spouse ☐ Children ☐ Relatives ☐ Neighbours ☐ Others ..... ☐

26. Who motivated you to move to a cyclone shelter?

Self-motivation ☐ Children ☐ Relatives ☐ Neighbours ☐ Local leaders ☐

Spouse ☐ TV/radio ☐ CPP volunteer ☐ NGO staff ☐ Others ..... ☐

27. How long did you stay in the shelter?

Less than six hours ☐ 6-12 hours ☐ One day ☐ 2-3 days ☐ One week ☐ More than one week ☐

28. Did you experience any problems in the shelter? Yes ☐ No ☐

(If the answer is **No**, please move to the question 30)

---

29. If the answer is Yes, what types of problems did you experience in the shelter?

Sleeping problem ☐ Food problem ☐ Toilet problem ☐ Bathing/showering problem ☐

Lack of privacy ☐ Eve-teasing ☐ .... ☐ .... ☐

---

30. What did you do during **Sidr**?

Did nothing ☐ Called to Allah ☐ Kept children with me ☐ Had some food ☐

Took rest/ nap ☐ .... ☐ .... ☐ .... ☐

31. What did you do at first when **Sidr** stopped?

.....

.....

32. Did you get any relief? Yes ☐ No ☐

(If the answer is **No**, please move to the question **34**)

---

33. What kinds of relief items did you get?

Rice ☐ Pulse ☐ Kerocene ☐ Oil & salt ☐ Drinking water ☐ Cloths ☐

Lighter ☐ Candles ☐ Flattened rice & brown sugar ☐ Biscuits (cookies) ☐ ..... ☐ ..... ☐

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34. If you stayed at relative/neighbour's house or cyclone shelter during **Sidr**, what did you do at first after coming back to your own house?

.....
.....

35. Did you do loss and damage assessment? Yes ☐ No ☐

(If the answer **No**, please move to the question **37**)

---

36. If the answer is **Yes**, please mention the list of your lost and damaged goods.

Sl. No.	Goods/ items	Total amount (owned)	Amount of lost or damaged goods
1.	House		
2.	Rice		
3.	Pulse		
4.	Cloths		
5.	Ornaments		
6.	Radio/ TV		
7.	Bi-cycle/ van-rickshaw/ boat		
8.	Marriage photos		
9.	Religious books (e.g. the Quran)		
10.	Livestock		
11.	Poultry		
12.	Cash money		
13.	Children's books		
14.	Other (.....)		
15.	Other (.....)		

37. Do you think proper preparedness would minimise the losses and damages? Yes ☐ No ☐

(If the answer **No**, please move to the question **39**)

---

38. If the answer is **Yes**, why didn't you prepare yourself before **Sidr**?

No reason ☐ Surrendered to Allah for everything ☐ Waiting for husband ☐ Husband's decision ☐

Didn't get time to prepare ☐ Others did nothing, so me too ☐ Didn't expect such losses and ☐ .... ☐

☐ ☐ damages ☐ ☐

39. If the answer is No, why do you think it was not possible to minimise the losses and damages even though you would be well-prepared?

Own perception ☐ Nothing worked against Sidr ☐ .... ☐ .... ☐

40. Did you repair your damaged items? Yes ☐ No ☐

(If the answer **No**, please move to the question **42**)

41. If the answer is **Yes**, what items did you repair?

	Items	**How did you repair them?**	**Whom did you help?**
	Walls of the house		
	Roof of the house		
	Home plinth		
	Fence of the house		
	Vegetable bed & platofrms		

42. If the answer is **No**, why didn't you do so?

No reason ☐ Psychologically didn't fit ☐ Waiting for husband ☐ Husband's decision ☐

Didn't get enough time ☐ Others did nothing, so I also didn't do ☐ Lack of helping hands ☐ Waiting for relief & recovery services ☐

Lack of money ☐ Managed without repairing ☐ .... ☐ .... ☐

F. PREPAREDNESS FOR CYCLONE AILA

43. Did you observe the impacts of cyclone **Aila**? Yes ☐ No ☐

(If the answer **No**, please give thanks to the respondents and finish the interview at this point)

---

44. Did you receive any early warning before **Aila**? Yes ☐ No ☐

(If the answer **No**, please move to the question **48**)

---

45. If the answer **Yes**, whom did you receive the early warning?

Yourself ☐ Child ☐ Relative ☐ Neighbour ☐ Local leader ☐

Spouse ☐ TV/radio ☐ CPP volunteer ☐ NGO staff ☐ Other ..... ☐

46. Did you believe the early warning? Yes ☐ No ☐

(If the answer **Yes**, please move to the question 48)

---

47. If the answer No, why didn't you believe the warning?

Didn't disseminate strongly ☐ Early warnings of this type often disseminated ☐ A false warning was disseminated a few days ago ☐ .... ☐

---

48. What did you do after listening the cyclone warning?

Planning ☐ Food storage ☐ Store cloths ☐ Keep children with them ☐

Consult with partner ☐ Consult with other family members ☐ Look after neighbours ☐ Look after distant relatives ☐

Hide valuable assets ☐ Move to a cyclone shelter ☐ .... ☐ .... ☐

49. How did you preserve your assets before **Aila**?

Sl. No.	Assets	Amount	How did you preseve?	Whom did you help to do so?
1.	Steamed rice			
2.	Curry			
3.	Paddy rice			
4.	Pulse			
5.	Onions & chiliies			

Sl. No.	Assets	Amount	How did you preseve?	Whom did you help to do so?
6.	Vegetable			
7.	Cloths			
8.	Ornaments			
9.	Radio/TV			
10.	Bicycle/van-rickshaw/boat			
11.	Photos			
12.	Relious books			
13.	Livestock			
14.	Poultry			
15.	Cash money			
16.	Drinking water			
17.	Kerocene			
18.	Children's books			
19.				
20.				

50. What did you wear during **Aila**? (only for the female participants)

Shari ☐ Shari & blouse ☐ Long dress ☐ Salwer & kamiz ☐ Other ..... ☐

51. What was your clothing condition after Aila? (in the case of Shari)

It was on your body ☐ It was seperated from your body ☐ You lost your Shari ☐ Other ..... ☐

G. RESPONSE TO CYCLONE AILA

52. Where did you stay in during **Aila**?

Own house ☐ Neighbour's house ☐ Relative's house ☐ Cyclone shelter ☐ Other (.....) ☐

If the answer is **Own house**:

53. Why did you stay in your own house?

Didn't think that Aila would actually happen ☐ Didn't think that Sidr would bring such volume of losses and damage ☐ To protect assets ☐ Shelter condition was not up to the mark ☐

Location of ☐ Absense of husband ☐ ..... ☐ ..... ☐

shelter ☐ ☐ ..... ☐ ..... ☐

54. Whom did you stay with in that time?

Spouse ☐ Children ☐ Relatives ☐ Neighbours ☐ Others ..... ☐

If the answer is **Relative or neighbour's house**:

55. Why did stay in relative or neighbour's house?

Own house was unsafe ☐ That house was safe ☐ Absesnse of husband at home ☐ Stay together ☐

Distance of shelter ☐ Scared at own house ☐ .... ☐ .... ☐

56. Whom did you go with you?

Spouse ☐ Children ☐ Relatives ☐ Neighbours ☐ Others ..... ☐

If the answer is **Cyclone shalter**:

57. Why did you go to the shelter?

Own house was unsafe ☐ Relative or neighbour's house was unsafe too ☐ Absesnse of husband at home ☐ To stay together ☐

For relief assistance ☐ Scared at own house ☐ Motivated by the EW dissemination ☐ .... ☐

58. Whom did you go with you?

Spouse ☐ Children ☐ Relatives ☐ Neighbours ☐ Others ..... ☐

59. Who did motivate you to move to a cyclone shelter?

Self-motivation ☐ Children ☐ Relatives ☐ Neighbours ☐ Local leaders ☐

Spouse ☐ TV/radio ☐ CPP volunteer ☐ NGO staff ☐ Others ..... ☐

60. How long did you stay in the shelter?

Less than six hours ☐ 6-12 hours ☐ One day ☐ 2-3 days ☐ One week ☐ More than one week ☐

61. Did you experience any problems in the shelter? Yes ☐ No ☐

(If the answer **No**, please move to the question **63**)

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62. If the answer is Yes, what types of problems oyu experienced in the shelter?

Sleeping problem	☐	Food problem	☐	Toilet problem	☐	Bathing/showering problem	☐
Lack of privacy	☐	Eve-teasing	☐	....	☐	....	☐

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63. What did you do at first when **Aila** stopped?

Did nothing	☐	Called to Allah	☐	Kept children with you	☐	Having food	☐
Took rest/ nap	☐	....	☐	....	☐	....	☐

64. What did you do at first when **Aila** stopped?

.....

.....

65. Did you get any relief? Yes ☐ No ☐

(If the answer **No**, please move to the question **67**)

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66. What kinds of relief items you got?

Rice	☐	Pulse	☐	Kerocene	☐	Oil and salt	☐	Drinking water	☐	Cloths	☐
Lighter	☐	Candles	☐	Flattened rice and brown sugar	☐	Biscuits (cookies)	☐	....	☐	....	☐

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67. If you stayed at <u>relative or neighbour's house or cyclone shelter</u> during **Aila**, what did you do at first after coming back to your own house?

.....

.....

68. Did you do loss and damage assessment? Yes ☐ No ☐

(If the answer **No**, please move to the question **70**)

---

69. If the answer is **Yes**, please mention the list of your lost and damaged goods.

Sl. No.	Goods/ items	Total amount (owned)	Amount of lost or damaged goods
1.	House		
2.	Rice		
3.	Pulse		
4.	Cloths		
5.	Ornaments		
6.	Radio/ TV		
7.	Bi-cycle/ van-rickshaw/ boat		
8.	Marriage photos		
9.	Religious books (e.g. the Quran)		
10.	Livestock		
11.	Poultry		
12.	Cash money		
13.	Children's books		
14.	Other (.....)		
15.	Other (.....)		

70. Do you think proper preparedness would minimise the losses and damages? Yes ☐ No ☐

(If the answer **No**, please move to the question **72**)

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71. If the answer is **Yes**, why didn't you prepared yourself before **Aila**?

No reason ☐ Surrendered to Allah for everything ☐ Waiting for husband ☐ Husband's decision ☐

Didn't get time to prepare ☐ Others did nothing, I also didn't do ☐ Didn't expect such losses and damages ☐ .... ☐

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72. If the answer is **No**, why do you think it was not possible to minimize the losses and damages albeit you would well-prepared?

Own perception ☐ Nothing worked against Aila ☐ .... ☐ .... ☐

73. Did you repair your damaged items? Yes ☐ No ☐

(If the answer **No**, please move to the question **75**)

---

74. If the answer is **Yes**, what items did you repair?

	Goods/ items	How did you repair them?	Whom did you help?
	Walls of the house		
	Roof of the house		
	Home plinth		
	Fence of the house		
	Vegetable bed & platofrms		

75. If the answer is **No**, why didn't you do so?

No reason ☐	Psychologically didn't fit ☐	Waiting for husband ☐	Husband's decision ☐
Didn't get enough time ☐	Others did nothing, I also didn't do ☐	Lack of helping hands ☐	Waiting for relief & recovery services ☐
Lack of money ☐	Managed without repairing ☐	..... ☐	..... ☐
		.....	.....

76. Did you utilise the experiences of cyclone **Sidr** in the case of cyclone **Aila** Yes ☐ No ☐

(If the answer **No**, please move to the question **78**)

77. If the answer is **Yes**, how did you utlise the experience of **Sidr** in the case of **Aila**?

Preparedness ☐	Believe the early warning ☐	Alerting others ☐	Going to the shelter ☐	Preservation of necessary food & goods ☐
Reseponse ☐	Damage assessment ☐	Participation in rescue work ☐	Repairing important goods ☐	Others .... ☐

78. Can you utilise the experiences of Sidr and Aila in future cyclonic events? Yes ☐ No ☐

79. If the answer is **No**, why do think you won't be able to utilise the experience?

Don't know the reason ☐	Due to poverty ☐	Dure to poor government assistance ☐	We can't do anything against Allah ☐
Well-off families do not donate up ☐	We are not well-prepared ☐	Difficulty in understanding the ☐	.... ☐

to the mark ☐ ☐ nature of cyclones ☐ ☐

80. Notes (if necessary)

( ) ……

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( ) ……

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( ) ……

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( ) ……

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…… **.....……..…....**

Signature of the interviewer **Signature of the researcher**

Complete the interview giving thanks to the participant

References

REFERENCES

Adger, W. N. (1996) *Approaches to Vulnerability to Climate Change*. CSERGE Working Papers. Norwich: University of East Anglia.

Adger, W. N. (1999) Social vulnerability to climate change and extremes in coastal Vietnam. *World Development*, 27: 249–269.

Adger, W. N. (2000) Social and ecological resilience: are they related? *Progress in Human Geography*, 24(3): 347–364.

Adger, W. N. (2001) *Social Capital and Climate Change*, Working Paper 8. Norwich: Tyndall Centre for Climate Change Research, University of East Anglia.

Adger, W. N. (2003) Social Capital, Collective Action, and Adaptation to Climate Change. *Economic Geography*, 79(4): 387–404.

Adger, W. N. (2006) Vulnerability. *Global Environmental Change*, 16: 268–281.

Adger, N. and Brooks, N. (2003) *Country Level Risk Measures of Climate-related Natural Disasters and Implications for Adaptation to Climate Change*, Working Paper 26. Norwich: Tyndall Centre for Climate Change Research.

Adger, W. N., Arnell, N. and Thompkins, E. M. (2005) Successful adaptation to climate change across scales. *Global Environmental Change*, 15: 77–86.

ADB (Asian Development Bank) (1994) *Climate Change in Asia: Bangladesh Country Report*. Mandaluyong, the Philippines: ADB.

ADB (2012) *Addressing Climate Change and Migration in Asia and the Pacific*. Mandaluyong, the Philippines: ADB.

ADPC (Asian Disaster Preparedness Center) (2007) *Community Based Early Warning Systems and Evacuation: Planning, Development and Testing – Protecting People's Lives and Properties from Flood Risks in Dagupan City, Philippines*. Safer Cities 20 Series – Case studies on mitigating disasters in Asia and the Pacific. Bangkok: ADPC.

AfDB, ADB and DFID (African Development Bank, Asian Development Bank and Department for International Development) (2003) *Poverty and Climate Change, Reducing the Vulnerability of the Poor through Adaptation*. Washington, D.C.: The World Bank.

Agrawala, S. (ed.) (2005) *Bridge over Troubled Waters: Linking Climate Change and Development*. Paris: Organization for Economic Co-operation and Development.

Agrawala, S., Ota, T., Ahmed, A. U., Smith, J., and van Aalst, M. (2003) *Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sundarbans*. Paris: OECD.

Ahmad, Q. K. (2012) *Bangladesh: Sustainable Development with Special Focus on Climate Change - Future Directions*, Keynote presentation at the seminar on "Sustainable Development with a Focus on Climate Change: Future Directions", organized by Planning Commission, Ministry of Planning, Government of Bangladesh, Dhaka, 11 October 2012.

Ahmad, Q. K., Ahmad, N. and Rasheed, K. B. S. (eds.) (1994) *Resources, Environment and Development in Bangladesh With Particular Reference to the Ganges, Brahmaputra and Meghna Basins*. Dhaka: Academic Publishers.

Ahmad, Q. K., Chowdhury, A. K. A., Imam, S. H. and Sarker, M. (eds.) (2000) *Perspectives on Flood 1998*. Dhaka: the University Press Limited.

Ahmed, A. U. (2006) *Bangladesh: Climate Change Impacts and Vulnerability – A Synthesis*. Dhaka: Government of the People's Republic of Bangladesh, Department of Environment, Climate Change Cell.

Ahmed, A. U. and Alam, M. (1998) Development of Climate Change Scenarios with General Circulation Models. In Huq, S., Karim, Z., Asaduzzaman, M. and Mahtab, F. (eds.), *Vulnerability and Adaptation to Climate Change for Bangladesh*. Dordrecht, the Netherlands: Kluwer Academic Publishers: 13–20.

Ahmed, A. U. and Mirza, M. M. Q. (2000) Review of Causes and Dimensions of Floods with Particular Reference to Flood '98: National Perspectives. In Ahmad, Q. K., Chowdhury, A. K. A., Imam, S. H. Sarker, M. (eds.), *Perspectives on Flood 1998*. Dhaka: the University Press Limited: 67–84.

Ahmed, A.U., Huq, S., Karim, Z., Asaduzzaman, M., Rahman, A.A., Alam, M., Ali, Y. and Chowdhury, R.A., 1996. 'Vulnerability and Adaptation Assessments for Bangladesh'. In Vulnerability and Adaptation to Climate Change, J.B. Smith, S. Huq, S. Lenhart, L.J. Mata, I. Nemesova and S. Toure (Eds.), Kluwer Academic Publishers, Dordrecht/Boston/London, 1996.

Ahmed, B., Hassan, A. S. M. F. and Islam, M. T. (2014) "Disaster induced Migration and Social Conflict in Bangladesh: Study on Cyclone Sidr". *International Journal of Interdisciplinary and Multidisciplinary Studies*, 1(4): 11–16.

Ahmed, F. E. (2008) Hidden Opportunities: Islam, masculinity and poverty alleviation, *International Feminist Journal of Politics,* 10 (4): 542–562.

Ahmed, I. (ed.) (1999) *Living with Floods: An Exercise in Alternatives*. Dhaka: University Press Limited.

Ahmed, N., Wahab, M. A., Shakuntala, H. T. (2007) Integrated aquaculture-agriculture systems in Bangladesh: Potential for sustainable livelihoods and nutritional security of the rural poor. *Aquaculture Asia*, 12(1): 14-22. Available at: http://library.enaca.org/ AquacultureAsia/Articles/Jan-March-2007/aa-jan-07.pdf. Accessed: 26 August 2015.

Alam, E. and Collins, A. E. (2010) Cyclone disaster vulnerability and response experiences in coastal Bangladesh. *Disasters*, 34(4): 931–953.

Alam, K., Saadi, S. and Islam, T. (2010) *Strengthening Preparedness and Response Capacity in Flood and Cyclone Prone Areas in Bangladesh*, Synthesis Report April 2010. Dhaka: Save the Children UK and Plan International.

Alam, M., Nishat, A. and Siddiqui, S. M. (1998) Water Resources Vulnerability to Climate Change with Special Reference to Inundation. In Huq, S. et al (eds.), *Vulnerability and Adaptation to Climate Change for Bangladesh*. Dordrecht: Kluwer Academic Publishers: 21–38.

Aldrich, D. P. (2012) *Building Resilience: Social Capital in Post–Disaster Recovery*. Chicago and London: University of Chicago Press.

Alexander, D. (2000) *Confronting Catastrophe*. New York: Oxford University Press.

Alexander, D. (2006) Globalization of disaster: trends, problems and dilemmas. *Journal of International Affairs*, 59: 1–22.

Ali, A. (1999) Climate change impacts and adaptation assessment in Bangladesh. *Climate Research*, 12: 109–116.

Aman, S. (1999) Women Coping with Floods. In: Ahmed, I. (ed.). *Living with Floods: An Exercise in Alternatives*. Dhaka: The University Press Limited.

Ammann, W. J., Dannenmann, S. and Vulliet L. (eds.) (2006) *Risk 21: Coping with Risks Due to Natural Hazards in the 21st Century*. London: Taylor and Francis Group.

Andersen, T. J. (2001) *Managing Economic Exposures of Natural Disasters: Exploring Alternative Financial Risk Management Opportunities and Instruments*. Washington, DC: Inter-American Development Bank.

Andersen, T. J. (2003) Globalization and Natural Disasters: An Integrative Risk Management Approach. In Kreimer, A., Arnold, M. and Carlin, A. (eds.), *The Future of Disaster Risk*. Washington DC: World Bank.

Anderson, M. (1990) Which Costs More: Prevention or Recovery? In Kreimer, A. and Munasinghe, M. (eds.), *Managing Natural Disasters and the Environment*. Washington DC: World Bank: 17–27.

Anderson, M. B. (2000) Vulnerability to disaster and sustainable development: A general framework for assessing vulnerability. In Pielke, R. jr and Pielke, R. sr (eds), *Storms (Vol. 1)*. London: Routledge: 11–25.

Ansari, M. N. A. (2013) *Hunger, Place and Seasonality: Understanding Monga Vulnerability in Northwest Bangladesh*, Durham theses, University of Durham. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/9439/. Accessed: 9 February 2015.

Ansari, S., Fulton, L., Bhuiya, A. and Chowdhury, M. (1997) *An Impact Evaluation of the Meghna-Dhonagoda Embankment*. Dhaka: BRAC and ICDDR'B.

Asaduzzaman, M., Reazuddin, M. and Ahmed, A. U. (eds.) (1997) *Global Climate Change: Bangladesh Episode*. Dhaka: Department of Environment, Ministry of Environment and Forest.

Asian Foundation (2012) *A Situation Analysis of Climate Change Adaptation Initiatives in Bangladesh*. Dhaka: The Asian Foundation.

Aven, T. (2011) On some recent definitions and analysis frameworks for risk, vulnerability, and resilience. *Risk Analysis*, 31(4): 515–522.

Ayers, J. (2010) *Understanding the Adaptation Paradox: Can Global Climate Change Adaptation Policy be Locally Inclusive?* Unpublished PhD Thesis. London: London School of Economics and Political Science.

Ayers, J. (2011) Resolving the adaptation paradox: exploring the potential for deliberative adaptation policy making in Bangladesh. *Global Environmental Politics*, 11(1): 62–88.

Ayers, J. and Forsyth, T. (2009) Community-based adaptation to climate change: Strengthening resilience through development. *Environment*, 51(4): 22–31.

Aysan, Y. F. (1993) Vulnerability assessment. In Merriman, P. A. and Browitt, C. W. A. (eds), *Natural Disasters: Protecting Vulnerability Communities*. London: Thomas Telford: 1–14.

Aysan, F. and Davis, I. (eds.) (1992) *Disasters and the Small Dwelling: Perspectives for the UN IDNDR*. London: James & James Science Press.

Bahadur, A. V., Ibrahim, M. and Tanner, T. (2013) "Characterising resilience: unpacking the concept for tackling climate change and development", *Climate and Development*, 5(1): 55–65.

Banglapedia (undated) *Cyclone*. Available at: http://en.banglapedia.org/index.php?title=Cyclone. Access: 9 February 2014.

Banglapedia (2012) *Flood*. Available at: http://www.banglapedia.org/HT/F_0114.htm. Access: 7 February 2014.

Bankoff, G. (2001) Rendering the world safe: vulnerability as western discourse. *Disasters*, 25(10): 19–35.

Bankoff, G. (2004) *The Historical Geography of Disaster: 'Vulnerability' and 'Local Knowledge' in Western Discourse*. London: Earthscan.

Baqee, A. (1998) *Peopling in the Land of Allah Jane – Power, Peopling and Environment: The Case of Char-lands of Bangladesh*. Dhaka: University Press Limited.

BARD (Bangladesh Academy for Rural Development) (1983). *The Works of Akhtar Hameed Khan*. Volumes I–III. Comilla: BARD.

Barnett, J. and Adger, W. N. (2007) Climate change, human security and violent. *Political Geography*, 26(6): 639–655.

Barrows, H. H. (1923) Geography as Human Ecology. *Annals of the Association of American Geographers*, 13(1): 1–14.

Bassett, T. J. and Zueli, K. B. (2000) Environmental discourses and the Ivorian Savannah. *Annals of the Association of American Geographers*, 90 (1): 67–95.

BBC (British Broadcasting Corporation) (2007) *Tropical Cyclone Sidr Slams into Bangladesh*. Available at: www.bbc.co.uk/weather/world/news/16112007news. shtml. Access: 16 November 2008.

BBC (2014) *Ebola drains already weak West African health systems*. Published on 24 September 2014. Available at: http://www.bbc.co.uk/news/world-africa-29324595. Accessed: 08 February 2015.

BBS/GoB (Bangladesh Bureau of Statistics, Statistics and Information Management Division, Ministry of Planning, Government of the People's Republic of Bangladesh) (2013) *Statistical Year Book*. Dhaka: BBS, GoB.

BBS/GoB (2014) *Statistical Year Book*. Dhaka: BBS, GoB.

BCAS/RA/Approtech (Bangladesh Center for Advanced Studies, Resource Analysis and Approtech Consultants Limited) (1994) *Vulnerability of Bangladesh to Climate Change and Sea Level Rise: Concepts and Tools for Calculating Risk in Integrated coastal Zone Management*. Technical Reports, Vol. I and II, Summary Report and Institutional Report. Dhaka: BCAS, RA and Approtech.

BCCRF/GoB (2015) *Why Bangladesh Climate Change Resilience Fund?* Available at: http://bccrf-bd.org/page/why-bccrf.html. Accessed: 29 August 2015.

BCCT/GoB (Bangladesh Climate Change Trust, Ministry of Environment and Forests, GoB) (2014) *Annual Report 2013–2014* (in Bangla). Dhaka: Bangladesh Climate Change Trust, Ministry of Environment and Forests, Government of the People's Republic of Bangladesh.

BCCT/GoB (2015) *Climate Change Trust Fund (CCTF)* Available at: http://www.bcct.gov.bd/index.php/trust-fund. Accessed: 29 August 2015.

Bedford, T. and Burgess, J. (2002) The focus-group experience. In Limb, M. and Dwyer, C. (eds.), *Qualitative methodologies for geographers: Issues and debates*. London: Edward Arnold.

Begum, A. (1985) *Women and technology in rice processing in Bangladesh*. Los Banos, the Philippines: IRRI.

Begum, A. (2004) NGO Activities in Rural Bangladesh: Beneficiary perceptions about the impacts. In Hasan, S. and Lyons, M. (eds), *Social Capital in Asian Sustainable Development Management*: 101-112.

Béné, C., Cannon, T., Davies, M., Newsham, A. and Tanner, T. (2014), Social Protection and Climate Change, **OECD Development Co-operation Working Papers**, No. 16. Paris: OECD Publishing.

Bengtsson, L., Hodges, K. I. and Roeckner, E. (2006) Storm tracks and climate change. *Journal of Climate*, 19(15): 3518–3543.

Bengtsson, L., Hodges, K. I. and Keenlyside, N. (2009) Will extratropical storms intensify in a warmer climate? *Journal of Climate*, 22(9): 2276–2301.

Berger, M. T. (2004) After the Third World? History, destiny and the fate of Third Worldism. *Third World Quarterly*, 25(1): 9–39.

Berkes, F. (2007) Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking. *Natural Hazards*, 41: 283–295.

Bern C., J. Sniezek, G.M. Mathbor, M.S. Siddiqi, C. Ronsmans, A.M. Chowdury, A.E. Choudhury, K. Islam, M. Bennish, E. Noji et al. (1993) Risk Factors for Mortality in the Bangladesh Cyclone of 1991. *Bulletin of the World Health Organization* 71(1): 73–8.

BGMEA (Bangladesh Garment Manufacturers and Exporters Association) (2015) *About BGMEA*. Available at: http://www.bgmea.com.bd/home/pages/aboutus#Vd2Z5PlViko. Accessed: 25 August 2015.

Bhuiyan, N. M. and Dutta, D. (2012) Analysis of flood vulnerability and assessment of the impacts in coastal zones of Bangladesh due to potential sea-level rise. *Natural Hazards*, 61: 729–743.

Birkmann, J. (2006) *Measuring Vulnerability to Natural Hazards – Towards Disaster Resilient Societies*. Tokyo: United Nations University Press.

Birkmann, J. and von Teichman, K. (2009) Addressing the challenge: recommendations and quality criteria for linking disaster risk reduction and adaptation to climate change. German Contribution to the Global Platform for Disaster Risk Reduction 2009. Power Point presentation to Global Platform 2009, available at: https://www.ehs.unu.edu/file/get/10638.pdf.

Birkmann, J. and von Teichman, K. (2010) 'Integrating Disaster Risk Reduction and Climate Change Adaptation: Key Challenges – Scales, Knowledge and Norms'. In Renaud, F. (ed), *Vulnerability, Risk and Adaptation in a Changing Climate*. Available at: https://www.ehs.unu.edu/file/get/10638.pdf. Accessed: 28 January 2015.

Biswas, A. K. (1979) Climate, agriculture and economic development. *Ecologist*, 6: 188–195.

Biswas, G. S. (2005) The Effects of Natural Hazards on Poor People's Livelihoods. In Khan, I. A. and Seeley, J. (eds.), *Making a Living: The Livelihoods of the Rural Poor in Bangladesh*. Dhaka: The University Press Limited: 125–139.

Black, R., Arnell, N. W., Adger, N., Thomas, D. and Geddes, A. (2013) "Migration, immobility and displacement outcomes following extreme events", *Environmental Science & Policy*, 27(1): 32–43.

Blackburn, J and Holland, J. (eds) (1998) *Who Changes? Institutionalizing Participation in Development.* London: Intermediate Technology Publications.

Blaikie, P. M. and Brookfield, H. (eds.) 1987. *Land degradation and society*. Methuen, London.

Blaikie, P. M., Cannon, T., Davis, I. and Wisner, B. (1994) *At Risk: Natural Hazards, People's Vulnerability and Disasters.* London: Routledge.

Blood, P. R. (1988) Historical Setting. In Heitzman, J. and Worden, R. (eds.) Bangladesh: A Country Study. Washington, D.C.: Federal Research Division, Library of Congress. http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field(DOCID+bd0026)

Bohle, H.-G. (2011): Social Vulnerability and Livelihood Security. Towards an Integrated Framework for Market Risk Assessment, In: Gertel, J. and Le Heron, R. (eds.), *Economic Spaces of Pastoral Production and Commodity Systems: Markets and Livelihood*. Farnham, Burlington: Ashgate Publishing: 43–51.

Bohle, H.-G., Downing, T. E. and Watts, M. J. (1994) Climate change and social vulnerability: Toward a sociology and geography of food insecurity. *Global Environmental Change*, 4(1): 37–48.

Bouma, G. D. (2000) *The Research Process*. Oxford: Oxford University Press.

Bouwer, L. M. (2011) Have disaster losses increased due to anthropogenic climate change? *Bulletin of the American Meteorological Society*, 92: 39–46.

Bouwer, L. M. and Aerts, J. C. J. H. (2006) Financing Climate Change Adaptation. *Disasters*, 30(I): 49-63.

Boyce, J. K. (1990) Birth of a megaproject: political economy of flood control in Bangladesh. *Environmental Management*, 14(4): 419–428.

Brammer, H. (1990) Floods in Bangladesh I: Geographical Background to the 1987 and 1988 Floods. *The Geographical Journal*, 156: 12–22.

Brammer, H. (1999) *Agricultural disaster management in Bangladesh.* Dhaka: University Press Limited (UPL).

Brammer, H. (2004) *Can Bangladesh be protected from floods?* Dhaka: UPL.

Brammer, H. (2010) After the Bangladesh Flood Action Plan: Looking to the Future. *Environmental Hazards* 9: 118–130.

Brammer, H. (2014) Bangladesh's dynamic coastal regions and sea-level rise. *Climate Risk Management*, 1: 51–62.

Brenkert, A. L. and Malone, E. L. (2005) Modeling vulnerability and resilience to climate change: A case study of India and Indian States. *Climatic Change*, 72(1-2): 57–102.

Brewer, J. D. (2000) *Ethnography*. Buckingham: Open University Press.

Briguglio, L. (1995) Small island states and their economic vulnerabilities. *World Development*, 23: 1615–1632.

Briguglio, L. (1997) *Alternative economic vulnerability indices for developing countries*. Report prepared for the United Nations Department of Economic and Social Affairs. New York: UN DESA.

Briscoe, J. (2009) Water Security: Why It Matters and What to Do about It. *Innovations Technology Governance Globalization*, 4(3): 3–28.

Brklacich, M. and Bohle, H.-G. (2006) Assessing human vulnerability to global climatic change. In Ehlers, E. and Krafft T. (eds.), *Earth System Science in the Anthropocene*. Berlin: Springer: 51-61.

Brokensha, D., Warren, D., and Werner, O. (1980) *Indigenous Knowledge Systems and Development*. Washington D.C.: University Press of America.

Brooks, N. (2003) *Vulnerability, Risk and Adaptation: A Conceptual Framework*. Norwich: Tyndall Centre for Climate Change Research, University of East Anglia.

Brouwer, R., Akter, S., Brander, L. and Haque, E. (2007) Socioeconomic vulnerability and adaptation to environmental risk: a case study of climate change and flooding in Bangladesh. *Risk Analysis*, 27(2): 313–326.

BRRI (Bangladesh Rice Research Institute) (2015) *BRRI's Achievement: Five years of the present Government*. Available at: http://brri.gov.bd/site/notices/ 2f126970-b247-4ff3-820c-d888a119f543. Accessed: 9 February 2015.

Bryant, A. C. (2005) *2003 Annual Tropical Cyclone Report* (ed.) Pearl Harbor, Hawaii: U.S. Naval Pacific Meteorology and Oceanography Center/ Joint Typhoon Warning Center.

Bryant, R. L. and Bailey, S. (1997) *Third World Political Ecology*. London and New York: Routledge.

Bryman, A. (2001) *Social Research Methods.* Oxford: Oxford University Press.

BUP-CEARS-CRU (1994) *Bangladesh: Greenhouse Effect and Climate Change, Briefing Document, No. 1–7*. Dhaka: Bangladesh Unnayan Parishad.

Burgess, R. G. (1991) *In the Field: An Introduction to Field Research*. London: Routledge.

Burton, I., Kates, R. and White, G. (1993) *The Environment as Hazard.* New York: Guilford Publications.

Burton, I. (1997) Vulnerability and Adaptive Response in the Context of Climate and Climate. *Climate Change*, 36(1/2): 185–196.

Burton, I. and van Aalst, M. (2004) *Look before You Leap: A Risk Management Approach for Incorporating Climate Change Adaptation in World Bank Operations*. Washington, DC: World Bank.

Butzer, K. (1980) Adaptation to global environmental change. *Professional Geographer*, 32: 269–278.

BWDB/GoB (Bangladesh Water Development Board, Ministry of Water Resources Management, GoB) (1998) *Annual Flood Report*. Dhaka: BWDB, Flood Forecasting and Warning Centre.

Byravan, S. and Rajan, S. C. (2008) *The social impacts of climate change in South Asia*. Available at: http://ssrn.com/abstract=1129346. Accessed: 20 March 2013.

Caldwell, J. C., Caldwell, P., Caldwell, K. B. and Pieris, I. (1998) The Construction of Adolescence in a Changing World: Implications for Sexuality, Reproduction and Marriage. *Studies in Family Planning*, 29(2): 66–78.

Campbell, J. R. (1990) Disasters and development in historical context: Tropical cyclone response in the Banks Islands, Northern Vanuatu. *International Journal of Mass Emergencies and Disasters*, 8(3): 401–24.

Campbell, J. R. (2006) *Traditional Disaster Reduction in Pacific Island Communities*. New Zealand: Institute of Geological and Nuclear Sciences Limited.

Cannon, T. (1991) *Food systems and marginal lands; Avoiding environmental determinism in explaining hunger*. London: School of Humanities, Thames Polytechnic.

Cannon, T. (1994) Vulnerability Analysis and the Explanation of 'Natural' Disasters. In Varley, A. (ed.), *Disasters, Development and Environment*. Chichester, UK: Wiley: 13–30.

Cannon, T. (2000) Vulnerability Analysis and Disasters. In Parker, D. (ed.) *Floods*. London: Routledge: 43–55.

Cannon, T. (2006) Vulnerability analysis, livelihoods and disasters. In Ammann, W. J., Dannenmann, S. and Vulliet L. (eds.), *Risk 21: Coping with Risks Due to Natural Hazards in the 21st Century*. London: Taylor and Francis Group: 41–49.

Cardona, O. D. (1999) Environmental management and disaster prevention: Two related topics: A holistic risk assessment and management approach. In Ingleton, J. (ed.), *Natural Disaster Management*. London: IDNDR-Tudor Rose: 151–153.

Cardona, O. D. (2004) The Need for rethinking the concepts of vulnerability and risk from a holistic perspective: A necessary review and criticism for effective risk management. In Bankoff, G., Frerks, G. and Hilhorst D. (eds.), *Mapping Vulnerability: Disasters, Development and People*. London: Earthscan Publishers: 37–51.

Cardona, O. D. (2008) *Indicators of Disaster Risk and Risk Management: Program for Latin America and the Caribbean – Summary Report – Second Edition*. Washington, DC: Inter-American Development Bank.

Cardona, O. D. (2011) Disaster risk and vulnerability: Notions and measurement of human and environmental insecurity. In Brauch, H. G., Oswald Spring, U., Mesjasz, ., Grin, J., Kameri-Mbote, P., Chourou, B., Dunay, P. and Birkmann, J. (eds.), *Coping with Global Environmental Change, Disasters and Security – Threats, Challenges, Vulnerabilities and Risks*. Hexagon Series on Human and Environmental Security and Peace, Vol. 5. Berlin and New York: Springer Verlag: 107–121.

CARE Bangladesh (2015) *About SHOUHARDO II Program*. Available at: http://www.carebangladesh.org/shouhardoII/abt_shouhardo.php. Accessed: 29 August 2015.

CARE International (2009) *Climate Vulnerability and Capacity Analysis Handbook*. Chatelaine, Switzerland: CARE International.

CARE International (2010) *Community-Based Adaptation Toolkit*. Chatelaine, Switzerland: CARE International. Available at: www.careclimatechange.org/files/toolkit/CARE_CBA_Toolkit.pdf. Accessed: 15 October 2014.

Carney, D., Drinkwater, M., Rusinow, T., Neefjes, K., Wanmali, S. and Singh, N. (1999) *Livelihoods Approaches Compared: A Brief Comparison of the Livelihood Approaches of the UK Department for International Development (DFID), CARE, Oxfam and the United Nations Development Programme (UNDP)*. London: DFID.

Carson, B. (1992) *The Land, the Farmer, and the Future: A Soil Fertility Management Strategy for Nepal*. ICIMOD Occasional Paper No. 21. Kathmandu, Nepal: International Centre for Integrated Mountain Development (ICIMOD).

Castells, M. (1984) Participation, politics, and spatial innovation: Commentary on Bologna, Orcasitas, and SAAL. In Hatch, R. (ed). *The Scope of Social Architecture.* New York: Van Nostrand Reinhold International: 284-285.

CCC/GoB (Climate Change Cell, Department of Environment, Ministry of Environment and Forests, GoB) (2008) *Characterizing long-term changes of Bangladesh climate in context of agriculture and irrigation*. Dhaka: CCC/GoB.

CCC/GoB (2009) *Adaptive Crop Agriculture Including Innovative Farming Practices in Haor Basin*. Dhaka: CCC, DoE, MoEF, GoB.

CCC/GoB (2015) *Climate Change Cell*. Available at: http://www.climatechangecell.org.bd/. Accessed: 08 February 2015.

CDMP (Comprehensive Disaster Management Programme) (2008) *Hazards of Bangladesh*. Available at: http://www.cdmp.org.bd/modules.php?name=Hazards&AutoID=1. Accessed: 08 February 2015.

CDMP (2015$_a$) *CRA Reports*. Available at: http://www.cdmp.org.bd/cra/. Accessed: 22 March 2015.

CDMP (2015$_b$) *The Comprehensive Disaster Management Programme (Phase II)*. Available at: http://www.cdmp.org.bd/. Accessed: 11 March 2015.

Chadwick, M. T. and Datta, A. (2000) *Water Resource Management in Bangladesh: a policy review*. London: DFID.

Chadwick, M. T., Soussan, J. G., Alam, S. S. and Mallick, D. (1999) *From Flood to Scarcity: Redefining the Water Debate in Bangladesh*. Environment and Development Series, No. 1 Environment Centre Working Papers. Leeds: University of Leeds.

Chadwick, M. T., Soussan, J. G., Martin, T. C., Mallick, D. and Alam, S. S. (2001) Bank robbery: The real losers in the 1998 Bangladesh flood. *Land Degradation & Development*, 12: 251–260.

Chakravarti R. (2008) Agricultural Technology in Medieval India. *The Medieval History Journal*, 11(2): 237–248.

Chambers, R. (1983) *Rural Development: Putting the Last First.* Harlow: Longman.

Chambers, R. and Conway, G. (1991) *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Brighton, UK: Institute of Development Studies.

Chambers, R. and Shah, P. (1991) *Participatory Rural Appraisal: Recent Developments and Implications*. Brighton: IDS.

Chatterji, J. (1999) The Fashioning of a Frontier: The Radcliffe line and Bengal's Border Landscape, 1947- 1952. *Modern Asian Studies*, 33(1).

Chaudhary, N. and Parthasarathy, D. (2007) Gender, work and household food security. *Economic and Political Weekly*, February 10.

Chen, M. (ed.) (1991) *Coping with Seasonality and Drought*. New Delhi: Sage Publications.

Chowdhury, S. K. (1994) *Socio-Environmental Assessment Summary of the Meghna Dhonagoda Irrigation Project*. Dhaka: Bangladesh Engineering and Technical Services.

Chowdhury, A.M.R., A.U. Bhuyia, A.Y. Choudhury and R. Sen (1993) The Bangladesh Cyclone of 1991: Why So Many People Died. *Disasters* 17(4): 291–304.

Chowdhury, S. R., Hossain, M. S., Shamsuddoha, M. and Khan, S. M. M. H. (2012) *Coastal fishers' livelihood in peril: Sea surface temperature and tropical cyclones in Bangladesh*. Dhaka: Center for Participatory Research and Development.

Christensen, K., Raihan, S., Ahsan, R. Uddin, A. M. N., Ahmed, C. S. and Wright, H. (2012) *Financing Local Adaptation: Ensuring Access for the Climate Vulnerable in Bangladesh*. Dhaka: ActionAid Bangladesh.

Christoplos, I., Anderson, S., Arnold, M., Galaz, V., Hedger, M., Klein, R. J. T. and Le Goulven, K. (2009) *The Human Dimension of Climate Adaptation: The Importance of Local and Institutional Issues*. Stockholm: Commission on Climate Change and Development.

CLP (Chars Livelihoods Programme) (2015) *Overview*. Available at: http://clp-bangladesh. org/work/overview/. Accessed: 11 August 2015.

Coleman, J. (1988) Social Capital in the Creation of Human Capital. *American Journal of Sociology*, 94: 95–120.

Coles, A. and Wallace, T. (2005) Water, Gender and Development: An Introduction. In Coles, A. and Wallace, T. (eds.), *Gender, Water and Development*. Oxford: Oxford International Publishers Ltd.

Collins, A. E. (2009) *Disaster and Development*. London: Routledge.

Collins, A. E. (2013) "Applications of the disaster risk reduction approach to migration influenced by environmental change", *Environmental Science & Policy*, 27(1): 112–125.

Collins, A. E., Jones, S., Manyena, B. and Jayawickrama, J. (Eds.) (2015) *Hazards, Risks and Disasters in Society*. Oxford: Elsevier.

Collins, A. E., Scheurer, R., Goldsmith, V., Mileti, D. S., Ytre, A. and Agarwal, S. P. (2009) Early warning: a people-centred approach and the 'last mile'. *World Disaster Report 2009: Focus on early warning, early action*. Genva: International Federation of Red Cross and Red Crescent Societies (IFRC). P. 38–67.

Comfort, L., Wisner, B., Cutter, S., Pulwarty, R., Hewitt, K., Oliver-Smith, A., Wiener, J., Fordham, M., Peacock, W. and Krimgold, F. (1999) Reframing disaster policy: the global evolution of vulnerable communities. *Environmental Hazards*, 1: 39–44.

Cooke, B. and Kothari, U. (eds) (2001) *Participation: The New Tyranny?* London: Zed Books.

Coppola, D. P. (2006) *Introduction to International Disaster Management*, Oxford: Butterworth-Heinemann Ltd.

Cornwall, A. (2000) *Beneficiary, Consumer, Citizen: Perspectives on Participation for Poverty Reduction, Sida Studies* 2.

Cornwall, A. (2002) *Beneficiary, Consumer, Citizen: Perspectives on Participation for Poverty Reduction,* SIDA Studies 2. Stockholm: Swedish International Development Agency (SIDA).

CPD (Centre for Policy Dialogue) (2002) *Election 2001: National Policy Forum,* Policy Brief on Administrative Reform and Strengthening of Local Government System. Dhaka: CPD.

CPD (2007) *Bangladesh Vision 2021: Prepared under the initiative of Nagorik Committee 2006*. Dhaka: CPD.

CPP/GoB (Cyclone Preparedness Programme, Ministry of Disaster Management and Relief, GoB) (2015_a) *History*. Available at: http://www.cpp.gov.bd/site/page/8fafc5ba-1afb-4ac9-a7ee-67a29a58343a/. Accessed: 17 February 2015.

CPP/GoB (2015_b) *Present Volunteers Status*. Available at: http://www.cpp.gov.bd/site/page/39599343-77e6-45e7-9e8d-491270f56690/. Accessed: 27 February 2015.

Crang, M. and Cook, I. (2007) *Doing ethnographies.* London: SAGE Publications Ltd.

Creswell, J. W. and Clark, V. L. P. (2007) *Designing and conducting mixed methods research*. London: Sage.

Crow, G. and Allan, G. (1994) *Community life: An introduction to local social relationships*. Hemel Hempstead: Harvester-Wheatsheaf.

Cuny, F. C. (1983) *Disaster and Development*. New York: Oxford University Press.

Custers, P. (1992) Banking on a flood-free future? Flood mismanagement in Bangladesh. *The Ecologists*, 22(5): 241–247.

Cutter, S. L. (1993) *Living with Risk*. London: Edward Arnold.

Cutter, S. L. (1996) Vulnerability to environmental hazards. *Progress in Human Geography*, 20: 529–239.

Cutter, S. L. (2006) *Hazards, Vulnerability and Environmental Justice*. London: Earthscan.

Cutter, S. L. and Finch, C. (2008) Temporal and spatial changes in social vulnerability to natural hazards. *Proceedings of the National Academy of Sciences*, 105(7): 2301–2306.

Cutter, S. L., Mitchell, J. T. and Scott, M. S. (2000) Revealing the vulnerability of people and places: A case study of Georgetown County, South Carolina. *Annals of the Association of American Geographers*, 90(4): 713–737.

Cutter, S. L., Boruff, B. and Shirley, W. L. (2001) *Indicators of social vulnerability to hazards*, Unpublished Paper. Columbia, SC: University of South Carolina, Hazard Research Lab.

Cutter, S. L., Boruff, B. J. and Shirley, W. L. (2003) Social vulnerability to environmental hazards. *Social Science Quarterly*, 84(1): 242–261.

Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E. and Webb, J. (2008) A Place-Based Model for Understanding Community Resilience to Natural Disasters. *Global Environmental Change*, 18(4): 598–606.

Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D. and Yan, J. (2009) The impact of sea level rise on developing countries: a comparative analysis. *Climatic Change*, 93(3-4): 379–388.

Dash, B. (2002) *Warning and Response: A Case Study of Orissa Super Cyclone, 1999*. Dissertation submitted to Jawarahal Nehru University.

Dash, B. K., Rafiuddin, M., Khanam, F. and Islam, M. N., (2012) Characteristics of meteorological drought in Bangladesh. *Natural Hazard*, 6(5): 515–522.

Davies, M., Oswald, K., Mitchell, T. and Tanner, T. (2009) *Promoting Pro Poor Growth: Social Protection*. Paris: OECD Publishing.

Davis, I., Haghebaert, B. and Peppiatt, D. (2004) *Social Vulnerability and Capacity Analysis Workshop*, Discussion paper and workshop report. Geneva: ProVention Consortium.

DDM/GoB (Department of Disaster Management, Ministry of Disaster Management and Relief, GoB) (2013a) *Natural Disasters*. Available at: http://www.dmb.gov.bd/s-disaster. Access: 16 April 2013.

DDM/GoB (2013b) *Past Disasters*. Available at: http://www.dmb.gov.bd/ pastdisaster. Access: 22 April 2013.

DDM/GoB (2015) *Creation of Department of Disaster Management*. available at: http://www.ddm.gov.bd/site/page/48e43e67-78e6-428f-9be1-584e9f93446d. Accessed: 08 February 2015.

del Ninno, C., Dorosh, P. A. and Islam, N. (2002) Reducing vulnerability to natural disasters – Lessons from 1998 floods in Bangladesh. IDS Bulletin, 33: 98–107.

del Ninno, C., Dorosh, P. A. and Smith, L. C. (2003) Public policy, markets and household coping strategies in Bangladesh: avoiding a food security crisis following the 1998 floods. *World Development*, 31(7): 1221–1238.

Denscombe, M. (2003) *The good research guide: for small-scale social research projects*. Maidenhead: Open University Press.

Dercon, S. and Krishnan, P. (2000) Vulnerability, seasonality and poverty in Ethiopia. *Journal of Development Studies*, 36(6): 25–53.

Devereux, S., Vatila, B. and Swan, S. (2008) *Seasons of hunger: Fighting cycles of quiet starvation among the World's Rural Poor*. London: Pluto Press.

Dey, N. C., Alam, M. S., Sajjan, A. K., Bhuiyan, M. A., Ghose, L., Ibaraki, Y. and Karim, F. (2011) Assessing Environmental and Health impact of Drought in the Northwest Bangladesh. *Journal of Environmental Science and Natural Resources*, 4(2): 89–97.

DFID (Department for International Development) (1999) *Sustainable Livelihoods Guidance Sheets*. London: DFID.

DFID (2004) *Disaster Risk Reduction: a Development Concern*. London: DFID. http://www.DFID.gov.uk/pubs/iles/disaster-risk-reduction.pdf.

DFID (2005) *Growth and poverty reduction: the role of agriculture*. A DFID policy paper. London: DFID.

DFID (2006) *Eliminating World Poverty: Making Governance Work for the Poor: A White Paper on International Development*. London: DFID.

Dilley, M. and Boudreau, T. E. (2001) Coming to terms with vulnerability: A critique of the food security definition. *Food Policy*, 26: 229–247.

Dilley, M., Chen, R.S., Deichmann, U., Lerner-Lam, A.L., Arnold, M., Agwe, J., Buys, P., Kjekstad, O., Lyon, B. and Yetman, G. (2005) *Natural disaster hotspots: a global risk analysis* (Disaster Risk Management Working Paper Series No. 5.), Washington DC: The World Bank, Hazard Management Unit.

Divjak, C. (2008) *Corruption and shoddy construction behind school collapses in China earthquake*. Available at: https://www.wsws.org/en/articles/2008/10/chin-o16.html. Accessed: 23 May 2014.

Dodman, D. and Mitlin, D. (2011) Challenges to community-based adaptation. *Journal of International Development*, 23(3).

Doerfel, M. L., Lai, C.-H. and Chewning, L. V. (2010) The Evolutionary Role of Interorganizational Communication: Modeling Social Capital in Disaster Contexts. *Human Communication Research*, 36(2): 125–162.

Douglas, I., Alam, K., Maghenda, M., Mcdonnell, Y., Mclean, L. and Campbell, J. (2009) Unjust waters: Climate change, flooding and the urban poor in Africa. In Bicknell, J.,

Dodman, D. and Satterthwaite, D. (eds.). *Adapting Cities to Climate Change*. London: Earthscan: 201–224.

Dow, K. (1992) Exploring differences in our common future(s): the meaning of vulnerability to global environmental change. *Geoforum*, 23: 417–436.

Duggleby, W. (2005) What about focus group interaction data? *Qualitative Health Research, 1* (6): 832–840.

Dynes, R. R. (2005) *Community Social Capital as the Primary Basis for Resilience*. Newark, Delaware: Disaster Resource Center, University of Delaware.

Eakin, H. and Luers, A. L. (2006) Assessing the vulnerability of social-environmental systems. *Annual Review of Environment and Resources*, 31: 365–394.

Ebi, K. L. (2008) Community-based adaptation to the health impacts of climate change. *American Journal of Preventive Medicine*, 35(5): 501–507.

EC (European Commission) (2003) *Climate Change in the Context of Development Cooperation*. COM (2003) 85 final. Brussels: EC.

Edgeworth, R. (2010) *Self-Care for Health in Rural Bangladesh*, Unpublished PhD Thesis. Newcastle-upon Tyne: Northumbria University.

Elahi, K. M. and Ara, I. (2008) *Understanding Monga in Northern Bangladesh*. Dhaka: Academic Press and Publishers Library.

El-Beltagy, A., Hamdi, Y., El-Gindy, M., Hussein, A. and Abou-Hadid, A. (1997) Dryland farming research in Egypt: Strategies for developing a more sustainable agriculture. *American Journal of Alternative Agriculture*, 12(3): 124–129.

Ellis, F. (2000) The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics*, 51(2): 289–302.

Ely, M., Anzul, M., Friedman, T., Garner, D. and Steinmetz, A. M. (1991) *Doing qualitative research: circles within circles*. London: The Falmer press.

Emanuel, K. A. (2000) A statistical analysis of tropical cyclone intensity. *Monthly Weather Review*, 128(4): 1139–1152.

Emanuel, K. (2005) Increasing destructiveness of tropical cyclones over the past 30 years. *Nature*, 436(7051): 686-688.

Emanuel, K. A. (2007) Environmental factors affecting tropical cyclone power dissipation. *Journal of Climate*, 20(22): 5497–5509.

Enarson, E. (2010) Gender. In Phillips, B. D., Thomas, D. S. K., Fothergill, A. and Blinn-Pike, L. (eds.), *Social Vulnerability to Disasters*. Boca Raton, Florida: CRC Press: 123–154.

Enarson, E. and Chakrabarti, P. G. D. (eds.) (2009) *Women, Gender and Disaster: Global Issues and initiatives*. New Delhi: Sage Publications.

Enarson, E. and Morrow, B. H. (1997) A gendered perspective: The voices of women. In Peacock, W. G., Morrow, B. H. and Gladwin H. (eds.), *Hurricane Andrew: Ethnology, Gender, and the Sociology of Disasters*. London: Routledge: 116–140.

Enarson, E. and Morrow B. H. (eds.) (1998) *The Gendered Terrain of Disaster: Through Women's Eyes*. Westport, Connecticut: Praeger.

Ericson, J. P., Vorosmarty, C. J., Dingman, S. L., Ward, L. G. and Meybeck, M. (2005) Effective sea-level rise and deltas: Causes of change and human dimension implications. *Global Planetary Change*, 50: 63–82.

Faaland, J. and Parkinson, J. R. (1976) *Bangladesh: The Test Case for Development*. London: C. Hurst & Co.

FAO (1999) *PRA Tool Box*. Available at: http://www.fao.org/docrep/003/x5996e/x5996e06.htm. [Accessed: 21 August 2015].

FAO (2007) *Climate Variability and Change: Adaptation to Drought in Bangladesh*. Rome: FAO.

FEMA (Federal Emergency Management Agency) (1997) FEMA Emergency Response Manual 1997. Washington, D.C.: FEMA.

Few, R. (2003) Flooding, vulnerability and coping strategies: local responses to a global threat. *Progress in Development Studies*, 3(1): 43–58.

Few, R., Osbahr, H., Bouwer, L. M., Viner, D. and Sperling, F. (2006) *Linking Climate Change Adaptation and Disaster Risk Management for Sustainable Poverty Reduction (Synthesis report)*. Washington, DC: Vulnerability and Adaptation Resource Group.

Few, R., Brown, K. and Tompkins, E. (2007) Public participation and climate change adaptation: avoiding the illusion of inclusion. *Climate Policy*, 7: 46–59.

Folke, C. (2006) "Resilience: The emergence of a prospective for social – ecological systems analyses", *Global Environmental Change*, 16(3): 253–267.

Ford Foundation (2003) *Women's health research manual*. Granted through the Department of International Health. Johns Hopkins School of Hygiene and Public Health. Available at: www.unu.edu.inupress/F002/UIN01E/uin0Ie)I.htm.

Fordham, M. (2007) *What is a Disaster?* Lecture notes distributed in the topic GEO235 Disaster Risk Reduction and Response. Northumbria University, Northumberland Building on 25 October.

Foresight: Migration and Global Environmental Change (2011) *Final Project Report*. London: The Government Office for Science.

Forsyth, T. and Leach, M. (1998) *Poverty and environment: priorities for research and policy: an overview study*. Brighton: IDS.

Fothergill, A. (1996) Gender, risk, and disaster. *International Journal of Mass Emergencies and Disasters*, 14(1): 33–56.

Fothergill, A. (1999) Women's role in disaster. *American Behavioral Science Review*, 7(2): 125–143.

Fothergill, A. (2004) *Heads above Water: Gender, Class and Family in the Grand Forks Flood*. Albany, New York: SUNY Press.

Fox, M. (2014) *Runaway Doctors and Missing Supplies Cripple Care in Ebola-Hit Liberia*. NBC News, published on 8 October 2014. Available at: http://www.bet365.com/home/FlashGen4/WebConsoleApp.asp?affiliate=365_110924&cb=1032555458. Accessed: 9 February 2015.

FPCO (Flood Plain Coordination Organization) (1993) *Guidelines for People's Participation*. Dhaka: FPCO.

Franke, R. W. and Chasin, B. H. (1980) *Seeds of Famine: Ecological Destruction and the Development Dilemma in the West African Sahel*. Montclair, New Jersey: Allanheld Osmun.

Froggatt, K. A. (2001) The analysis of qualitative data: processes and pitfalls. *Palliative Medicine*, 15: 433–438.

Füssel, H.-M. (2007) Vulnerability: A generally applicable conceptual framework for climate change research. *Global Environmental Change*, 17: 155–167.

Gaillard, J. C. (2007) Resilience of Traditional Societies in Facing Natural Hazards. *Disaster Prevention and Management*, 16(4): 522–544.

Gaillard, J. C. (2010) Vulnerability, capacity, and resilience: Perspectives for climate and development policy. *Journal of International Development*. 22: 218–232.

Gaillard, J. C., Liamzon, C. and Villanueva, J. D. (2007) ''Natural' disaster? A retrospect into the causes of the late-2004 typhoon disaster in Eastern Luzon, Philippines'. *Environmental Hazards* 7(4): 257–270.

Gallopin, G. C. (2006) Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change*, 16(3): 293–303.

Gandy, M. (2008) Landscapes of disaster: water, modernity, and urban fragmentation in Mumbai. *Environment and Planning A*, 40: 108–130.

Gaskell, G. (2000) Individual and Group Interviewing. In Bauer, M. and Gaskell, G. (eds.), *Qualitative Researching with Text, Image and Sound: A Practical Handbook.* London: Sage: 38–57.

Geis, D. E. (2000) By Design: The Disaster Resistant and Quality-of-Life Community. *Natural Hazards Review*, 1(3): 151–160.

Gencer, E. A. (2013) *The Impact of Globalization on Disaster Risk Trends: A Macro- and Urban-Scale Analysis*. Background Paper prepared for the Global Assessment Report on Disaster Risk Reduction 2013. Geneva: UNISDR.

Gero, A., Méheux, K. and Dominey-Howes, D. (2011) Integrating community based disaster risk reduction and climate change adaptation: examples from the Pacific. *Natural Hazards and Earth System Sciences*, 11: 101–113.

Giddens, A. (1984) *The Constitution of Society*. Cambridge: Polity Press.

Giddens, A. (1993) *New Rules of Sociological Method*. Cambridge, UK: Polity Press.

Glantz, M. H. (ed.) (1999) *Creeping Environmental Problems and Sustainable Development in the Aral Sea Basin*. Cambridge: Cambridge University Press.

Glantz, M. H. (2003) *Climate Affairs*. Washington, D.C.: Island Press.

GoB (2000) *Zila Parishad Act, 2000*. Dhaka: GoB.

GoB (2005) *National Adaptation Programme of Action (NAPA)*. Dhaka: MoEF, GoB.

GoB (2007) *Bangladesh Capacity Development Action Plan for Sustainable Environmental Governance*. Dhaka: MoEF, GoB.

GoB (2008) *National Disaster Management Policy* (Draft). Dhaka: DMB, MFDM, GoB.

GoB (2009a) *Bangladesh Climate Change Strategy and Action Plan 2009*. Dhaka: MoEF, GoB.

GoB (2009b) *Local Government (City Corporation) (Amended) Act, 2009*. Dhaka: GoB.

GoB (2009c) *Local Government (Paurashava) Act, 2009*. Dhaka: GoB.

GoB (2009d) *Local Government (Union Parishad) Act, 2009*. Dhaka: GoB.

GoB (2009e) *Upazila Parishad Act, 2009*. Dhaka: GoB.

GoB (2010a) *National Plan for Disaster Management 2010-2015*. Dhaka: DMB, DMRD, MFDM, GoB.

GoB (2010b) *Standing Orders on Disasters*. Dhaka: DMB, DMRD, MFDM, GoB.

GoB (2011) *Sixth Five Year Plan FY2011-FY2015: Accelerating Growth and Reducing Poverty – Part 2: Sectoral Strategies, Programmes and Policies*. Dhaka: General Economic Division, Planning Commission, GoB.

GoB (2012a) *Bangladesh Gazette: Disaster Management Act*. Dhaka: GoB.

GoB (2012b) *Perspective Plan of Bangladesh 2010-2021: Making Vision 2021 a reality*. Dhaka: General Economic Division, Planning Commission, GoB.

GoB (2014a) *Implementation Guideline for FFW* [in Bangla]. Dhaka: MoDMR, GoB.

GoB (2014b) *Implementation Guideline for TR* [in Bangla]. Dhaka: MoDMR, GoB.

GoB (2014c) National Disaster Management Policy 2014 (Draft in Bangla). Available at: http://www.modmr.gov.bd/site/page/df859163-5ec5-4a6f-bb00-325b6c8fca2b/. Accessed: 9 September 2015.

GoB (2015a) *ADP 2015-2016*. Available at: http://www.plancomm.gov.bd/adp-2015-16/. Accessed: 27 August 2015.

GoB (2015b) *At a glance Ashrayan Project*. Available at: http://www.ashrayanpmo.gov.bd/site/page/5e75d465-34fa-48a6-b1af-54b983a666d7/About-Ashrayan. [Accessed: 10 October 2015]

GoB (2015c) *Bangladesh Gazette: Notification for exclusion and inclusion of territories*. Available at: http://www.minland.gov.bd/uploaded/documents/7/ 33580720-53a6-4a93-bc1d-97c968440b30.pdf. [Accessed: 22 August 2015]

GoB (2015d) *Bangladesh National Portal*. Available at: http://bangladesh.gov.bd/. Accessed: 10 July 2015.

GoB (2015e) *District wise distribution of CI sheets and cash for housing of year 2015-2016* [in Bangla]. Available at: http://modmr.portal.gov.bd/sites/default/files/files/modmr.portal.gov.bd/page/ef1cfaee_8b99_4d0a_97b3_516b398e6b78/402.pdf. Accessed: 29 August 2015.

GoB (2015f) *Others Guideline/Policy*. Available at: http://www.ddm.gov.bd/site/ page/ b4a26719-b2b8-4679-9a3b-56549113ecdc. [Accessed: 28 August 2015]

GoB (2015g) *Overviewof Bangladesh Ansar and VDP*. Available at: http://www.ansarvdp.gov.bd/contentShow.php?action=showconts&id=3. [Accessed: 26 October 2015]

Gómez-Echeverri, L. (2000) (ed.) *Climate Change and Development*. New Haven: Yale School of Forestry and Environmental Studies and New York: UNDP.

Goss, J. D., and Leinbach, T. R. (1996) Focus groups as alternative research practice: Experience with trans-migrants in Indonesia. *Area*, 28(2): 115–123.

Goulden, M. (2006) *Livelihood Diversification, social capital and resilience to climate variability amongst natural resource dependent societies in Uganda*. Unpublished PhD Thesis. Norwich: School of Environmental Sciences, University of East Anglia.

Grindle, M. S. (ed.) (1980) *Politics and policy implementation in the Third World*. Princeton: Princeton University Press.

Grossman, L. 1998. *The Political Ecology of Bananas: Contract Farming, Peasant, and Agrarian Change in the Eastern Caribbean*, University of North Carolina Press, Chapel Hill.

Guba, E. G. and Lincoln, Y. S. (2005) Paradigmatic controversies, contradictions, and emerging influences. In Denzin, N. K. and Lincoln, Y. S. (eds), *The Sage Handbook of Qualitative Research*. Thousand Oaks, CA: Sage.

Hammersley, M. and Atkinson, P. (1983) *Ethnography: Principles in practice*. London: Tavistock.

Hamilton, J. P. and Halvorson, S. J. (2007) The 2005 Kashmir earthquake. *Mountain Research and Development*, 27(4): 296–301.

Hanchett, S. (1997) Women's empowerment and the development research agenda: A personal account from the Bangladesh flood action plan. *Feminist Issues*, 15(1): 42–71.

Haque, A . N., Grafakos, S. and Huijsman, M. (2012) Participatory integrated assessment of flood protection measures for climate adaptation in Dhaka. *Environment & Urbanization*, 24(1): 197–213.

Haque, C. and Zaman, M. (1989) Coping with riverbank erosion hazard and displacement in Bangladesh: Survival strategies and adjustments. *Disasters*, 13(4): 300–314.

Haque, C. and Zaman, M. (1993) Human Responses to Riverine Hazards in Bangladesh: A Proposal for Sustainable Development, *World Development*, 27: 93–107.

Haque, C. E. and Zaman, M. (1994) Vulnerability and Responses to Riverine Hazards in Bangladesh: A Critique of Flood Control and Mitigation Approaches. In Varley, A. (ed.), *Disasters, Development and Environment.* New Jersey: John Wiley & Sons: 65–79.

Haque, M. A., Rahman, M. F., Begum, H. and Hamid, A. (2013) *Qualitative survey assessing impacts from Cyclone Sidr and Aila on the communities of Koyra and Gabura, Bangladesh*. 26 December to 6 January 2013.

Haque, S. A. (2012) Salinity problems and crop production in coastal regions of Bangladesh. *Pakistan Journal of Botany*, 38(5): 1359–1365.

Hassan, M., Atkins, P. J. and Dunn, C. E. (2005) Social implications of arsenic poisoning in Bangladesh. *Social Science and Medicine*, 61(10): 2201–2211.

Hawkes, S. and Hart, G. (2000) Men's sexual health matters: promoting reproductive health in an international context. *Tropical medicine & international health*, 5(7): 37–44.

Hawkins, R. L. and Maurer, K. (2010) Bonding, Bridging and Linking: How Social Capital Operated in New Orleans Following Hurricane Katrina. *British Journal of Social Work*, 40(6): 1777–1793.

Hay, I. (2010) *Qualitative Research Methods in Geography*. Melbourne: Oxford University Press.

Hellmuth M. E., Moorhead A., Thomson M. C. and Williams J. (2007) *Climate Risk Management in Africa: Learning from Practice*. Climate and Society No. 1. New York: ***International Research Institute*** for Climate and Society (IRI), Colombia University.

Helmer, M. and Hilhorst, D. (2006) Natural Disasters and Climate Change. *Disasters*, 30(1): 1–4.

Hewitt, K. (ed.) (1983) *Interpretations of Calamity from the Viewpoint of Human Ecology*. London: Allen & Unwin.

Hewitt, K. (1996) *Regions of Risk: A Geographical Introduction to Disaster*. Harlow: Longman.

Hewitt, K. (1997) *Regions of Risk: A Geographical Introduction to Disasters*. Harlow: Longman.

Hewitt, K. (2007) 'Preventable disasters: addressing social vulnerability, institutional risk, and civil ethics'. *Geographische Rundscahu, International Edition* 3(1): 43–52.

Hickey, S. and Mohan, G. (eds.) (2004) *Participation from Tyranny to Transformation? Exploring New Approaches to Participation in Development*. London: Zed.

Hilhorst D. and G. Bankoff (2004) 'Mapping Vulnerability'. In G. Bankoff, G. Frerks and D. Hilhorst (eds.) *Mapping Vulnerability: Disaster, Development and People*. London: Earthscan. pp. 1–10.

Hofer, T. and Messerli, B. (2006) *Floods in Bangladesh: History, dynamics and rethinking the role of the Himalayas*. Tokyo, New York and Paris: United Nations University Press.

Holling, C. S. (1973) Resilience and stability of ecological system. *Annual Review of Ecology and Systematics,* 4: 1–23.

Hossain, A. N. H. A. (2003) Bangladesh: Flood Management. In Technical Support Unit (ed.) *Integrated Flood Management*. Geneva: WMO and Global Water Partnership.

Hossain, M., Islam, A. T. M. A. and Saha, S. K. (1987) *Floods in Bangladesh: Recurrent Disaster and People's Survival*. Dhaka: University Research Centre.

Huda, E. (2005) *Introduction to PRA Tools*. Dhaka: PRA Promoters' Society.

Huq, S., Karim, Z., Asaduzzaman, M. and Mahtab. F. (1998) *Vulnerability and Adaptation to Climate Change for Bangladesh*. Alphen aan den Rijn, the Netherlands: Kluwer Academic Publishers.

Huq, S., Rahman, A., Konate, M., Sokona, Y. and H. Reid. (2003) *Mainstreaming Adaptation to Climate Change in Least Developed Countries (LDCs)*. London: IIED.

Huq, S., Reid, R., Konate, M., Rahman, A., Sokona, Y. and Crick, F. (2004) Mainstreaming adaptation to climate change in least developed countries (LDCs). *Climate Policy,* 4:25–43.

Huq, S. and Reid. H. (2007) *A vital approach to the threat climate change poses to the poor*, Community-Based Adaptation: An IIED Briefing. London: IIED.

Hussam, A. (2009) Contending with a Development Disaster: SONO Filters Remove Arsenic from Water in Bangladesh. *Innovations Technology Governance Globalization*, 4(3): 89–102.

Hutton, D. and Haque, C. E. (2003) Patterns of Coping and Adaptation among Erosion-Induced Displacees in Bangladesh: Implications for Hazard Analysis and Mitigation. *Natural Hazards*, 29(3): 387–403.

Hutton, D. and Haque, C. E. (2004) Human Vulnerability, Dislocation and Resettlement: Adaptation Processes of River-bank Erosion-induced Displacees in Bangladesh. *Disasters*, 28(1): 41–62.

IDMC (Internal Displacement Monitoring Centre, the Norwegian Refugee Council) (2009) *Internal Displacement: Global Overview of Trends and Developments in 2008*. Geneva: IDMC.

IFRC (International Federation of Red Cross and Red Crescent Societies) (2002) *World Disasters Report 2002: Focus on Reducing Risk*. Geneva: IFRC.

IFRC (2009) *World Disasters Report 2009: Focus on early warning, early action*. Geneva: IFRC.

IFRC (2014) *World Disasters Report 2014: Focus on Culture and Risk*. Geneva: IFRC.

Ikeda, K. (1995) 'Gender Differences in Human Loss and Vulnerability in Natural Disasters: A Case Study from Bangladesh'. *Indian Journal of Gender Studies*, 2(2):171-93.

Independent, Long Beach, California (1971) *Pakistan Cyclone Relief Still Jumbled and Inadequate*. Dated on: 14 January 1971. Available at: http://www.newspapers.com/image/?spot=2956692&fcfToken=6e4f3448524551523442566430774942324431543162717943767863536155517046432b7559315830644468634862 4c445866544c496e643650703358464b2b. Accessed: 24 August 2014.

Inglis, J. (1993) *Traditional Ecological Knowledge: Concepts and Cases*. International Program on Traditional Ecological Knowledge. Winnipeg, Canada: International Development Research Centre.

IPCC (Intergovernmental Panel on Climate Change) (1995) *Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change*: Scientific-Technical Analyses. Cambridge: Cambridge University Press.

IPCC (2001) *Climate Change 2001: Working Group II: Impacts, Adaptation and Vulnerability*. Summary for Policymakers. IPCC, Geneva. http://www.grida.no/climate/ipcc_tar/wg2/010.htm#28.

IPCC (2007) *Climate Change 2007: Impacts, Adaptation, and Vulnerability*. Working Group II Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Summary for Policy Makers. IPCC, Geneva, Switzerland. Available at: http:// www.ipcc.ch/SPM13apr07.pdf (accessed 10 June 2007).

IPCC (2012) *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Group I and II of the Intergovernmental Panel on Climate Change [Field, C. B., Barros, V., Stocker, T. F., Qin, D., Dokken, D. J., Ebi, K. L., Mastrandrea, M. D., Mach, K. J., Plattner, G. K., Allen, S. K., Tignor, M. and Midgley, P. M. (eds.)]. Cambridge, UK and New York, USA: Cambridge University Press.

IPCC (2013) *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge, UK and New York, USA: Cambridge University Press.

IPCC (2014) *Climate Change 2014: Synthesis Report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Geneva: IPCC.

Iqbal, M. J., Ali, F. M. and Khursheed, M. B. (2014) Analysis of Media in Disaster Reporting in Pakistan. *European Scientific Journal*, 1: 570–575.

Islam, M. R. (2007) Pre and post tsunami coastal planning and land use policies issues in Bangladesh. *Proceedings of the Workshop on Coastal Area Planning and Management in Asian Tsunami-affected Countries*. Rome: FAO.

Islam, M. R., and Ahmed, M. (2004) *Living in the coast: problems, opportunities and challenges*. Dhaka: Program Development office for Integrated Coastal Zone Management Plan Project, Water Resources Planning Organization.

Islam, M. S. and Wahab, M. A. (2000) *Socioeconomic and Environmental Impact of Shrimp Farming in Bangladesh: A PRA of two selected villages in Khulna and Cox's Bazar District*. Project paper prepared for BAURES-NORAD Project. Mymensingh, Bangladesh: Bangladesh Agricultural University (BAU).

Islam, S. N. and Gnauck, A. (2011) 'Water salinity investigation in the Sundarbans rivers in Bangladesh'. *International Journal of Water*, 6(1/2): 74–91.

ISPAN (Irrigation Support Project for Asia and the Near East) (1993) *Environmental Impact Assessment Case Study, Bhelumia-Bheduria Project: FAP 16 Environmental Study and FAP 19 Geographic Information System*. Dhaka: Ministry of Irrigation, Water Development and Flood Control, Flood Plan Co-ordination Organisation.

Iversen, V., Chhetry, B., Francis, P., Gurung, M., Kafle, G., Pain, A. and Seeley, J. (2006) High Value Forests, Hidden Economies and Elite Capture: Evidence from Forest User Groups in Nepal's Terai. *Ecological Economics*, 58: 93–107.

Jones, R. and Rahman, A. (2007) *Community-based adaptation*. Tiempo 64. London: IIED.

Jones, S., Aryal, K. and Collins, A. E. (2013) "Local-level governance of risk and resilience in Nepal", *Disasters*, 37(3): 442–467.

Kautilya (1961) *Arthasastra*, 7th edition, translated by R. Shamsastry. Mysore: Mysore Printing and Publishing House.

Kelly, M. and Adger, N. (2000) 'Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation'. *Climatic Change*, 47: 325–352.

Kelman, I. (2008) Relocalising disaster risk reduction for urban resilience. *Urban Design and Planning*, 161(DP4): 197–204.

Kelman, I. (2015) Climate Change and the Sendai Framework for Disaster Risk Reduction. *International Journal of Disaster Risk Science*, 6: 117–127.

Kelman, I. and Gaillard, J. C. (2008) 'Placing Climate Change within Disaster Risk Reduction'. *Disaster Advances*, 1(3): 3–5.

Kelman, I., Mercer, J. and West, J. (2009) Combining Different Knowledges: Community Based Climate Change Adaptation in Small Island Developing States. *Participatory Learning and Action Notes*, 60: 41–53.

Khalequzzaman, M. D. (1994) Recent Floods in Bangladesh - Possible Causes and Solutions. *Natural Hazards*, 9: 65–80.

Khan, A. H. (1998) International Water Management Issue: South Asian Perspective. In Ali, M. M., Hoque, M. M., Rahman, R. and Rashid, S. (eds.), *Bangladesh Floods: Views from Home and Abroad*. Dhaka: The University Press Limited: 219–226.

Khan, M. N. H., Mia, M. Y. and Hossain, M. R. (2012) Impacts of Flood on Crop Production in Haor Areas of Two Upazillas in Kishoregonj. *Journal of Environmental Science and Natural Resources*, 5(1): 193–198.

Kholiquzzaman, Q. et al (ed) (1998) *Perspectives on Flood*. Dhaka: University Press Limited.

Klein, R. J. T, Nicholls, R. J. and Thomalla, F. (2003) Resilience to natural hazards: how useful is this concept? *Global Environmental Change*, 5: 35–45.

Knegt, J.-W. F. (2002) *Drainage in Developing Countries: A review of institutional arrangements*. Washington DC: International Bank for Reconstruction and Development, Rural Development Department.

Kreimer, A. and Munasinghe, M. (eds.) (1990) *Managing Natural Disasters and the Environment*. Washington DC: World Bank.

Krueger, R. A. and Casey, M. A. (2000) *Focus groups: A practical guide for applied researchers* (3rd edn.). Thousand Oaks, CA: SAGE Publications Ltd.

Kumar, U., Baten, M. A., Al-Masud, A., Osman, K. S. and Rahman, M. M. (2010) *Cyclone Aila: One Year on, Natural Disaster to Human Sufferings*. Dhaka: Unnayan Onneshan.

Kuzel, A. J. (1992) Sampling in qualitative inquiry. In Crabtree, B. F. and Miller, W. L. (eds.), *Doing qualitative research.* Newbury Park, CA: SAGE Publications Ltd: 31 – 44.

Latour, B. (1999) *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.

Lavell, A. (2003) *Local level risk management: Concept and practices*. Quito, Ecuador: CEPRE-DENAC-UNDP.

Lavell, A. (2005) *Local level risk management: concept and practice*. Quito: CEPREDENAC-UNDP.

Lavell, A., (2009) *Technical Study in Integrating Climate Change Adaptation and Disaster Risk Management in Development Planning and Policy*, Study undertaken for the Inter-American Development Bank. Washington, DC: Inter-American Development Bank.

Lavell, A. and Lavell, C. (2009) *Local Disaster Risk Reduction Lessons from the Andes. Series: Significant Local Development Initiatives in the Face of Disaster Risk*. Lima, Peru: General Secretariat of the Andean Community.

Leaf, M. (1997) Local control versus technocracy: The Bangladesh Flood Response Study. *Journal of International Affairs*, 51(1): 179–200.

Leal, P. and Opp, R. (1998) *Participation and Development in the Age of Globalization.* Ottawa: Canadian International Development Agency.

LEG/UNFCCC (Least Developed Countries Expert Group, UNFCCC) (2002) *Annotated guidelines for the preparation of national adaptation programmes of action*. Bonn: LEG, UNFCCC.

Lewis, J. (1999) *Development in Disaster-prone Places: Studies of Vulnerability*. London: Intermediate Technology Publications.

Lewis, J. (2007) *Climate and Disaster Reduction*. Tiempo Climate Newswatch. http://www. tiempocyberclimate.org/newswatch/comment070217.htm.

Lewis, J. (2009) An island characteristic: Derivative vulnerabilities to indigenous and exogenous hazards. *Shima: The International Journal of Research into Island Cultures*, 3(1): 3–15.

Lewis, J. and Kelman, I. (2009) Housing, flooding and risk-ecology: Thames Estuary South-Shoreland and North Kent. *Journal of Architectural and Planning Research*, 26(1): 14–29.

LGED/GoB (Local Government Engineering Department, MoLGDR&C, GoB) (2015) Home page. Available at: http://www.paurainfo.gov.bd/portalui/NavigatePage.aspx. Accessed: 24 January 2016.

Lincoln, Y. S. and Guba, E. G. (1985) *Naturalistic Inquiry*. California: The Sage.

Mahtab, F. (1989) *Effect of climate change and sea level rise on Bangladesh. Expert Group on climate change and sea level rise*. London: Commonwealth Secretariat.

Mallick, B., Rahman, K. R. and Vogt, J. (2011) "Coastal livelihood and physical infrastructure in Bangladesh after cyclone Aila". *Mitigation and Adaptation strategies for Global Change*, 16(6): 629–648.

Mansuri, G. and Rao, V. (2004) *Community-based and Driven Development: A Critical Review*. World Bank Policy Research Working Paper 3209.

Mansuri, G. and Rao, V. (2013) *Localizing Development: Does Participation Work?* Washington, DC: World Bank.

Manyena, S. B. (2006) The concept of resilience revisited. *Disasters*, 30(4): 433–450.

Manyena, S. B. (2009) *Disaster Resilience in Development and Humanitarian Interventions*. PhD Thesis Unpublished. Newcastle-upon-Tyne: Northumbria University.

Manyena, S. B., O'Brien, G., O'Keefe, P. and Rose, J. (2011) "Disaster resilience: a bounce back or bounce forward ability?". *Local Environment*, 16(5): 417–424.

Manyena, S. B. and Gordon, S. (2014) "Bridging the concepts of resilience, fragility and stabilization", *Disaster Prevention and Management*, 24(1): 38–52.

Masaki, K. (2007) *Power, Participation and Policy: The Emancipatory Evolution of the Elite-controlled Policy Process*. Plymouth: Lexington Books.

Maskrey, A. (1989) *Disaster Mitigation: A Community Based Approach*. Oxford: Oxfam International.

Maskrey, A. (2011) Revisiting community based risk management. *Environmental Hazards*, 10: 1–11.

Matin, N. and Taher, M. (2001) The changing emphasis of disasters in Bangladesh NGOs. *Disasters*, 25(3): 227–239.

McEntire, D. A. and Myers, V. (2004) Preparing communities for disasters: Issues and processes for government readiness. *Disaster Prevention and Management*, 13(2): 140–152.

McGray, H., Hammill, A. and Bradley, R. (2007) *Weathering the Storm: Options for Framing Adaptation and Development*. Washington, D.C.: World Resources Institute.

Mechler, R., Linnerooth-Bayer, J., Hochrainer, S. and Pflug, G. (2006) Assessing financial vulnerability and coping capacity: The IIASA CATSIM model. In Birkmann, J. (ed.), *Measuring Vulnerability and Coping Capacity to Hazards of Natural Origin: Concepts and Methods*. Tokyo: United Nations University Press: 380–398.

Mehta, L., Leach, M., Newell, P., Scoones, I., Sivaramakrishnan, K. and Wray, S. (1999) *Exploring Understandings of Institutions and Uncertainty: New Directions in Natural Resources Management*. IDS Discussion Paper 372. Brighton: IDS.

Mercer, J. (2010) 'Disaster risk Reduction or Climate Change Adaptation: Are We Reinventing the Wheel?' *Journal of International Development*, 22(1): 247–64.

Mercer, J., Dominey-Howes, D., Kelman, I. and Lloyd, K. (2007) The Potential for Combining Indigenous and Western Knowledge in Reducing Vulnerability to Environmental Hazards in Small Island Developing States. *Environmental Hazards*, 7: 245–256.

Mercer, J., Kurvits, T., Kelman, I. and Mavrogenis, S. (2014) Ecosystem-Based Adaptation for Food Security in the AIMS SIDS: Integrating External and Local Knowledge. *Sustainability*, 6(9): 5566–5597.

Micklin, P. P. (1988) Desiccation of the Aral Sea: A Water Management Disaster in the Soviet Union. *Science*, 241(4870): 1170–1176.

Micklin, P. P. (2000) *Managing Water in Central Asia: Central Asian and Caucasian Prospects*. London: Royal Institute of International Affairs.

Middleton, N. and O'Keefe, P. (1998) *Disasters and Development: The Politics of Humanitarian Aid*. London: Pluto Press.

Middleton, N. and O'Keefe, P. (2001) *Redefining Sustainable Development*. London: Pluto Press.

Miles, M. and Huberman, A. (1994) *An expanded sourcebook: qualitative data analysis*. London: Sage.

Milly, P. C. D., Wetherald, R. T., Dunne, K. A. and Delworth, T. L. (2002) Increasing risk of great floods in a change climate. *Nature*, 415: 514–517.

Mirza, M. Q. (1991) *Environmental Impacts of Water Development Projects: A Case Study on Chandpur Irrigation Project*. MSc Thesis Unpublished. Dhaka: Bangladesh University of Engineering and Technology (BUET).

Mirza, M. M. Q. (2002) Global Warming and Changes in the Probability of Occurrence of Floods in Bangladesh and Implications. *Global Environmental Change*, 12: 127–138.

Mirza, M. Q. and Paul, S. (1992) *Natural Disaster and Environment in Bangladesh* (in Bangla). Dhaka: Centre for Environmental Studies and Research.

Mitchell, T. and van Aalst, M. (2008) *Convergence of Disaster Risk Reduction and Climate Change Adaptation: A Review for DFID*. Brighton: Institute of Development Studies.

Mitchell, T., van Aalst, M. and Villaneuva, P. (2010) *Assessing Progress on Integrating Disaster Risk Reduction and Climate Change Adaptation in Development Processes*.

Brighton: Strengthening Climate Resilience Programme, Institute of Development Studies.

Mitlin, D., Hickey, S. and Beddington, A. (2007) Reclaiming development? NGOs and the challenge of alternatives. *World Development*, 35(10): 1699–1720.

MoDMR/GoB (Ministry of Disaster Management and Relief, GoB) (2012) *Bangladesh Hyogo Framework for Action (HFA) Monitoring and Review: Through a Multi Stakeholder Engagement Process 2011–2013, Interim Report for the period of January 2011 – August 2012*. Dhaka: Government of the People's Republic of Bangladesh, Ministry of Disaster Management and Relief.

Mohammad, S. M. (2009) *People's Vulnerability and Adaptation to Floods: A Study on the Char-dwellers of the Jamuna River in Bangladesh*. An MSc Dissertation Unpublished. Newcastle-upon-Tyne: Northumbria University.

Mohammad, S. M. (2010) Globalisation and Environmental Sustainability: An Overview of Coastal Bangladesh. *RDA Journal of Bangladesh Rural Development Studies*, 13(1): 43–64.

Mohammad, S. M. (2014) "Understanding Disaster Impacts through a Gender Lens: A Study on the Char dwellers of the Jamuna River in Bangladesh", *RDA Journal of Bangladesh Rural Development Studies*, 17(1): 63–74.

Mohammed, E. Y. (ed.) (2013) *Incentive-based Hilsa fish conservation and management in Bangladesh: prospects and challenges*. Workshop Report, March 24-25, IIED, London.

Mohan, G and Stokke, K. (2000) Participatory development and empowerment: the dangers of localism. *Third World Quarterly,* 21 (2):247–268.

Molla, H. R. (2011) 'Embankment and Changing Micro-Topography of Lower Ajoy Basin in Eastern India', *Ethiopian Journal of Environmental Studies and Management*, 4(4): 50–61.

Morrow, B. H. and Enarson, E. (1996) Hurricane Andrew through women's eyes: Issues and recommendations. *International Journal of Mass Emergencies and Disasters*, 14(1): 5–22.

Moser, S. C. (2010) Now more than ever: The need for more socially relevant research on vulnerability and adaptation to climate change. *Applied Geography*, 30(4): 464–474.

MRA (Microcredit Regulatory Authority) (2009) *NGO-MFIs in Bangladesh, Vol. V.* Dhaka: MRA, Bangladesh Bank.

Munich Re Group (2002) *Annual Review: Natural Catastrophes*. Munich: Munich Re Group. http://www.munichre.com/publications/302-03631_en.pdf.

Murphy, S. A. (2007) An Explanatory Model of Recovery from Disaster Loss. *Research in Nursing & Health*, 12(2): 67–76.

Nadiruzzaman, M. (2008) *Rural local government and state politics in Bangladesh*, Durham Theses. Durham: University of Durham.

Nakagawa, Y. and Shaw, R. (2004) Social Capital: A Missing Link to Disaster Recovery. *International Journal of Mass Emergencies and Disasters*, 22(1): 5–34.

NARRI (National Alliance for Risk Reduction and Response Initiative) (2015_a) *About NARRI*. Available at: http://narri-bd.org/index.php/aboutus/narri. Accessed: 29 August 2015.

NARRI (2015_b) *DIPECHO*. Available at: http://narri-bd.org/index.php/projects/dipecho. Accessed: 29 August 2015.

Nasreen, M. (1999) Coping with Floods: Structural Measures or Survival Strategies? In Ahmed, I. (ed.), *Living with Floods: An Exercise in Alternatives*. Dhaka: The University Press Limited.

Nasreen, M. (2012) *Women and Girls: Vulnerable or Resilient?* Dhaka: Institute of Disaster Management and Vulnerability Studies, University of Dhaka.

Nath, B. (2008) *Nothing is Bliue*. New Delhi: Harper Collins.

Nelson, D. R. (2005) *The Public and Private Sides of Persistent Vulnerability to Drought: An Applied Model for Public Planning in Ceará, Brazil*, Unpublished PhD Thesis. Tucson, AZ: University of Arizona.

Nelson, N. and Wright, S. (eds) (1995) P*ower and Participatory Development: Theory and Practice.* London: Intermediate Technology Publications.

Nelson, V., Meadows, K., Cannon, T., Morton, J. and Martin, A. (2002) Uncertain prediction, invisible impacts, and the need to mainstream gender in climate change adaptations. In Masika, R. (ed.), *Gender and Development*. Oxford: Routledge: 51–59.

Neumayer, E. and Plumper, T. (2007) The gendered nature of natural disasters: The impact of catastrophic events on the gender gap in life expectancy, 1981-2002. *Annals of the Association of American Geographers*, 97(3): 551–566.

New Age (2008) *Sundarbans tourism overcomes Sidr shocks*. 21 January 2008.

Nicholls, R. J., Mimura, N. and Topping, J. (1995) Climate change in South and Southeast Asia: some implications for coastal areas. *Journal of Global Environment Engineering*, 1: 137–154.

Nihoul J. C. J., Zavialov, P. O. and Micklin, P. P. (eds.) (2004) Dying and Dead Seas: Climatic vs Anthropic Causes, *NATO Science Series IV: Earth Environmental Science*, Vol. 36. Boston: Kluwer Academic Publishers.

Nizamuddin, K. (ed.) (2001) *Disaster in Bangladesh: Selected Readings*. Dhaka: Disaster Research Training and Management Centre, University of Dhaka.

Noji, E. (1997) *The Public Health Impacts of Disasters*. New York: Oxford University Press.

Norgaard, R. B. (1994) *Development Betrayed: The End of Progress and a Coevolutionary Revisioning of the Future*. London and New York: Routledge.

Nunn, P. D. (2009) Responding to the challenges of climate change in the Pacific Islands: management and technological imperatives. *Climate Research*, 40: 211–231.

Nunn, P. D. and Britton, J. M. R. (2001) Human-environment relationships in the Pacific Islands around AD 1300. *Environment and History*, 7(1): 3–22.

Nunn, P. D., Hunter-Anderson, R., Carson, M. T., Thomas, F., Ulm, S. and Rowland, M. J. (2007) Times of Plenty, Times of Less: Last-millenium Societal Disruption in the Pacific Basin. *Human Ecology*, 35: 385–401.

O'Brien, G., O'Keefe, P. and Rose, J. (2008) The Vulnerable Society. *Area*, 40(4): 520–521..

O'Brien, G., O'Keefe, P., Rose, J. and Wisner, B. (2006a) Climate Change and Disaster Management. *Disasters*, 30(I): 64–80.

O'Brien, K., Eriksen, S., Sygna, L. and Naess, L. O. (2006b) Questioning complacency: Climate change impacts, vulnerability, and adaptation in Norway. *Ambio*, 35(2): 50–56.

O'Brien, K., Eriksen, S., Nygaard, L. P. and Schjolden, A. (2007) Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy*, 7(1): 73–88.

O'Brien, K., Sygna, L., Leichenko, R., Adger, W. N., Barnett, J., Mitchell, T., Schipper, L., Tanner, T., Vogel, C. and Mortreux, C. (2008) *Disaster Risk Reduction, Climate Change Adaptation and Human Security*, Oslo: GECHS.

O'Keefe, P., Westgate. K. and Wisner, B. (1976) Taking the naturalness out of natural disasters. *Nature*, 260 (15 April): 566–567.

Oliver-Smith, A. (1998) Global Changes and the Definition of Disasters. In Quarantelli, E. (ed.), *What is a Disaster? Perspectives on the Question*. London and New York: Routledge.

Olmos, S. (2001) *Vulnerability and Adaptation to Climate Change: Concepts, Issues, Assessment Methods*. www.cckn.net.

O'Riordan, T. (ed.) (2000) *Environmental Science for Environmental Management*. Harlow: Prentice Hall.

Oxfam GB (2010) *Evaluation of the River Basin Programme in Bangladesh*. Available at: http://policy-practice.oxfam.org.uk/publications/final-evaluation-of-the-river-basin-programme-in-bangladesh-119434. Accessed: 28 Auguest 2015.

Oxfam International (2011) *Extreme weather endangers food security 2010-11: A grim foretaste of future sufferings and hunger?* Oxfam Media Briefing. Oxford: Oxfam International.

Parr, H. (2001) Negotiating different ethnographic contexts and building geographical knowledge: empirical examples from mental health research. In Limb, M. and

Dwyer, C. (eds.), *Qualitative Methodologies fro Geographers: Issues and Deb*ates. Arnold, London: 181–195.

Paul, B. G. and Vogl, C. R. (2011) Impact of shrimp farming in Bangladesh: Challenges and alternatives. *Ocean and Coastal Management*, 54(3): 201–211.

Paul, B. K. (2009) Why Relatively Fewer People Died? The Case of Bangladesh's Cyclone Sidr. *Natural Hazards*, 50(2): 289–304.

Paul, B. K. and Dutt, S. (2010) Hazard Warnings and Responses to Evacuation Orders: The Case of Bangladesh's Cyclone Sidr. *The Geographical Review*, 100(3): 336–355.

Paul, B. K., and Rasid, H. (1993) Flood damage to rice crop in Bangladesh. *Geographical Review*, *83*(2): 150–159.

Peacock, W., Morrow, B. H. and Gladwin, H. (eds.) (1997) *Hurricane Andrew: Ethnicity, Gender, and the Sociology of Disasters*. London: Routledge.

Pelling, M. (2003) *The Vulnerability of Cities: Social Resilience and Natural Disaster*. London: Earthscan.

Pelling, M. (2011) *Adaptation to Climate Change: From Resilience to Transformation*. Abingdon, UK: Routledge.

Pelling, M. and High, C. (2005) Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Global Environmental Change*, 15: 308–319.

Penning-Rowsell, E. C., Priest, S., Parker, D., Morris, J., Tunstall, S. Viavattene, C., Chatterton, J. B., and Owen, D. (2013) *Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal*. London: Routledge.

Picciotto, R. and Anderson, J. R. (1997) 'Reconsidering Agricultural Extension. *The World Bank Research Observer*, 12(2): 249–259.

PKSF (*Palli Karma-Sahayak* Foundation) (2015) *A brief of BCCTF project*. Available at: http://www.pksf-bd.org/?page_id=136. Accessed: 10 September 2015.

Platteau, J. P., and Abraham, A. (2002) Participatory Development in the Process of Endogenous Community Imperfections. *Journal of Development Studies*, 39(2): 104–136.

Platteau, J. P., and Gaspart, F. (2003) The Risk of Resource Misappropriation in Community-driven Development. *World Development*, 31 (10): 1687–1703.

Prabhakar, S. V. R. K. and Shaw, R. (2008) Climate change adaptation implications for drought risk mitigation: a perspective for India. *Climate Change*, 88: 113–130.

Practical Action (Undated) *Promoting adaptation to climate change in Bangladesh*, Policy Briefing. Dhaka: Practical Action.

Pratt, G. (2002) Studying immigrants in focus groups. In Moss, P. (ed.), *Feminist geography in practice: Research Methods*. Oxford: Blackwell.

Puente, S. (1999) Social vulnerability to disaster in Mexico City. In Mitchell, J. K. (ed), *Crucibles of Hazard: Mega-Cities and Disasters in Transition*. Tokyo: United Nations University Press: 295–334.

Quarantelli, E. L. (ed.) (1998) *What is a Disaster? Perspectives on the Question*. London: Routledge.

QSR International (2014) *What is Qualitative Research?* Available at: http://www.qsrinternational.com/what-is-qualitative-research.aspx. Accessed: 08 February 2015.

Rahman, A. (1986) *Impact of Riverbank Erosion: Survival Strategies of Displacees*, ADAB News, XVII.

Rahman, M. A. (2011) Study on the Changes of Coastal Zone: Chittagong to Cox′s Bazar along the Bay of Bengal. In: *Global Summit on Coastal Seas*, EMECS 9, Baltimore, Maryland, USA, August 28–31.

Rahman, M. H. (2003) *An Economic Study of Golda Shrimp Farming in Selected Areas of Jessore District*. Unpublished MSc Thesis submitted to the Department of Agricultural Economics. Mymensingh, Bangladesh: Bangladesh Agricultural University (BAU).

Rahman, M. R. (2010) Impact of Riverbank Erosion Hazard in the Jamuna Floodplain Areas in Bangladesh. *Journal of Science Foundation*, 8(1&2): 55–65.

Rahman, M. M., Islam, M. N., Ahmed, A. U. and Georgi, F. (2012) Rainfall and temperature scenarios for Bangladesh for the middle of 21st century using RegCM. *Journal of Earth System Science*, 121(2): 287–295.

Rahman, M. A., Mallick, F. H., Mondal, M. S. and Rahman, M. R. (2015) Flood shelters in Bangladesh: some issues from the user's perspective. In Collins, A. E., Jones, S., Manyena, B. and Jayawickrama, J. (eds.), *Hazards, Risks and Disasters in Society*. Oxford: Elsevier.

Raihan, S. (2013) *The Political Economy of Food Policy in Bangladesh*, The Political Economy of Food Price Policy, Research Brief No. 14. Available at: http://dyson.cornell.edu/faculty_sites/pinstrup/pdfs/ResearchBriefs/bangladesh.pdf. Accessed: 9 February 2015.

Ramamasy, S. and Baas, S. (2007) *Climate variability and change: adaptation to drought in Bangladesh*. A resource book and training guide. Rome: FAO.

Rasid, H., and Paul, B. K. (1987) Flood problems in Bangladesh: Is there any indigenous solutions? *Environmental Management,* 11(2): 155–173.

Rasid, H., Shuncai, S., Xiubo, Y. and Chen, Z. (1996) Structural vs Non-structural Flood-alleviation Measures in the Yangtze Delta: A Pilot Survey of Floodplain Residents' Preferences. *Disasters*, 20: 93–110.

Renard, Y. (1991) Institutional challenges for community-based management in the Research. In Denzin, N. K. and Lincoln, Y. S. (eds.), *Handbook of Qualitative Research* (2nd edn.). London: Sage: 1–29.

Riches, C. R. (2008**)** The High Barind Tract: a challenging drought-prone agricultural environment. In: Riches, C. R., Harris, D., Johnson, D. E. and Hardy, B., (eds.) *Improving agricultural productivity in rice-based systems of the High Barind Tract of Bangladesh*. Los Baños, Philippines: International Rice Research Institute (IRRI), pp. 3–6.

Robinson, G. M. (1998) *Methods and techniques in human geography*. Chichester: Wiley.

Rogers, P., Lydon, P. and Seckler, D. (1989) *Eastern Water study: Strategies to Manage Flood and Drought in the Ganges-Brahmaputra Basin*, Irrigation Support Project for

Asia and Near East (ISPAN). Washington, DC: The Office of Technical Resources, Agriculture and Rural Development Division, USAID.

Roy, K., Kumar, U., Mehedi, H., Sultana, T. and Ershad, D. M. (2009) *Initial damage assessment report of cyclone Aila with focus on Khulna district*. Khulna, Bangladesh: Unnayan Onneshan, Humanity Watch and Nijera Kori.

RT Network (2014) *UN tribunal puts an end to 40-year-old India-Bangladesh maritime dispute*. Available at: http://www.rt.com/op-edge/172960-un-india-bangladesh-dispute-end/. [Accessed: 22 August 2015]

SAARC (South Asian Association for Regional Cooperation) (2006) *Disaster Management in South Asia: A Framework for Action 2006-2015*. SAARC Expert Group Meeting on "Formulation of a Comprehensive Framework on Disaster Management", 7-9 February 2006,Dhaka, Bangladesh.

Schipper, E. L. F. (2007) *Climate Change Adaptation and Development: Exploring the Linkages*. Tyndall Centre Working Paper No. 107. Norwich: Tyndall Centre for Climate Change Research, University of East Anglia.

Schipper, L. (2009) Meeting at the crossroads? Exploring the linkages between climate change adaptation and disaster risk reduction. *Climate and Development*, 1: 16–30.

Schipper, L and Pelling, M. (2006) 'Disaster Risk, Climate Change and International Development: Scope for, and Challenge to, Integration'. *Disasters*, 30(I): 19-38.

Schmuck-Widmann, H. (1996) *Living with the Floods: Survival Strategies of Char-dwellers in Bangladesh*. Berlin: Hilbert & Pösger.

Schneider, S. H., Semenov, S., Patwardhan, A., Burton, I., Magadza, C. H. D., Oppenheimer, M., Pittock, A. B., Rahman, A., Smith, J. B., Suarez, A. and Yamin, F. (2007) Assessing key vulnerabilities and the risk from climate change. In Parry, M. L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J. and Hanson, C. E. (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press: 779–810.

Schuurr, M. A. and Swatuk, L. A. (eds.) (2012) *Natural Resources and Social Conflict: Towards critical Environmental Security*. Basingstoke: Palgrave Macmillan.

Scoones, I. (1998) *Sustainable Rural Livelihoods: A Framework for Analysis*. Brighton, UK: IDS, University of Sussex.

Scott, J. C. (1998) *Seeing like a State: How Certain Schemes to Improve the Human Condition have Failed.* London: Yale University Press.

Sen, A. (1982) *Poverty and Famines: An Essay on Entitlement and Deprivation*. Oxford: Oxford University Press.

Sen, A. K. (1999) *Development As Freedom.* Oxford: Oxford University Press.

Shabib, D. and Khan, S. (2014) Gender-sensitive adaptation policy-making in Bangladesh: status and ways forward for improved mainstreaming. *Climate and Development*, 6(4): 329–335.

Shahjahan, M. (1998) Flood Disaster Management in Deltaic Plain Integrated with Rural Development. In Ali, M. M., Hoque, M. M., Rahman, R. and Rashid, S. (eds.), *Bangladesh Floods: Views from Home and Abroad*. Dhaka: The University Press Limited: 39–53.

Shamsuddin, S. D., Islam, S. M. T., Rashid, M. S., and Alam, S. M. (2006) "Facets of hunger: Examining Monga in Northern Bangladesh". *The Jahangirnagar Review, Part II: Social Sciences*, 30: 110–118.

Shamsuddoha, M., Khan, S. M. M. H., Raihan, S. and Hossain, T. (2012) *Displacement and Migration from Climate Hot-spots in Bangladesh: Causes and Consequences*. Dhaka: ActionAid Bangladesh.

Shamsuddoha, M., Islam, M., Haque, M. A., Rahman, M. F., Roberts, E., Hasemann, A. and Roddick, S. (2013a) *Local Perspective on Loss and Damage in the Context of Extreme Events: Insights from Cyclone-affected Communities in Coastal Bangladesh*. Dhaka: Centre for Participatory Research and Development (CPRD).

Shamsuddoha, M., Roberts, E., Hasemann, A. and S. Roddick (2013b) *Establishing Links between Disaster Risk Reduction and Climate Change Adaptation in the Context of Loss and Damage: Policies and Approaches in Bangladesh*. Dhaka: ICCCAD.

Shaw, R., Prabhakar, S. V. R. K., Nguyen, H. and Mondal, P. (2007) *Drought-management Considerations for Climate-change Adaptation: Focus on the Mekong Region*. Oxford: Oxfam.

Shaw, R., Takeuchi, Y. and Rouhban, B. (2009) Education, capacity building and public awareness for disaster reduction. In Sassa, P. (ed.), *Landslides – Disaster Risk Reduction*. Berlin: Springer-Verlag: 499–515.

Shaw, R., Shiwaku, K. and Takeuchi, Y. (2011) *Disaster Education*. London: Emerald Publisher.

Shea, E. (2003) *Living with a Climate in Transition: Pacific Communities Plan for Today and Tomorrow*. Honolulu: East-West Center.

Shrestha, A. B., Shah, S. H. and Karim, R. (2008) Resource Manual on Flash Flood Risk Management Module 1: Community-based Management. Kathmandu: International Centre for Integrated Mountain Development (ICIMOD).

Siddique, Q. I. and Chowdhury, M. M. H. (2000) Flood '98: Losses and Damages. In Ahmed, Q. K., Chowdhury, A. K. A., Imam, S. H. and Sarker, M. (eds.), *Perspectives on Flood 1998*. Dhaka: The University Press Limited: 1-13.

Sikod, F. (2007) Gender division of labour and women's decision-making power in rural households in Cameroon. *African Development*, XXXII(3): 58–71.

Silverman, D. (1993) *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction.* London: Sage.

Smit, B. (ed.) (1993) *Adaptation to Climatic Variability and Change: Report of the Task Force on Climatic Adaptation*. Occasional Paper. No. 19. Guelph: Department of Geography, University of Guelph, Ontario.

Smit, B., Burton, B., Klein, R. J. T., and Wandel, J. (2000) 'An Anatomy of Adaptation to Climate Change and Variability'. *Climatic Change*, 45: 223–51.

Smit, B. and Wandel, J. (2006) Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16: 282–292.

Smith, K. (1996) *Environmental Hazards: Assessing Risk and Reducing Disaster*. Second Edition. London: Routledge.

Smith, J. B. (1997) ‘Setting Priorities for Adapting to Climate Change’. *Global Environmental Change*, 7(3): 251–64.

Smith, J. E., Heath, L. S. and Woodbury, P. B. (2004) How to Estimate Forest Carbon for Large Areas from Inventory Data. *Journey of Forestry*, July/August: 25–31.

Smith, K. and Petley, D. N. (2007) *Environmental Hazards: Assessing Risk and Reducing Disaster*. Fifth Edition. London and New York: Routledge.

Smithers, J. and Smit, B. (1997) ‘Human Adaptation to Climatic Variability and Change’. *Global Environmental Change*, 7(2): 129–46.

Southwick, S. M., Litz, B. T., Carney, D. and Friedman, M. J. (eds.) (2011) *Resilience and Mental Health: Challenges Across the Lifespan*. Cambridge, UK: Cambridge University Press.

Sperling, F. and Szekely, F. (2005) *Disaster Risk Management in a Changing Climate*. Discussion paper. Washington, D.C.: World Bank.

Stakhiv, E. Z. (1993) Water Resources Planning and Management Under Climate Uncertainty. In Ballentine, T. M. and Stakhiv, E. Z. (eds.), *Proceedings of the First National Conference on Climate Change and Water Resources Management.* Fort Belvoir, VA: U.S. Army Corps of Engineers Institute for Water Resources.

Steinberg, K. (2012) *Socio-economic impacts of shrimp farming in Bangladesh*. Unpublished MSc Dissertation. Stirling, Scotland: The University of Stirling.

Sultana, Z. (2010) “Impact of Monga on rural urban migration: Its socio-economic consequences”. *ASA University Review*, 4(2): 151–167.

Sultana, P., Johnson, C. and Thompson, P. (2008) The impact of major floods on flood policy evolution: insights from Bangladesh. *International Journal of River Basin Management*, 6(special issue): 1–10.

Sumon, A. and Islam, A. (2013) Agriculture Adaptation in Haor Basin. In Shaw, R., Mallick, F. and Islam, A. (eds.), *Climate Change Adaptation Actions in Bangladesh*. Tokyo: Springer.

Talukder, B. and Shamsuddin, D. (2012) Environmental Impacts of Flood Control Drainage and Irrigation (FCDI) Projects in a Non-Irrigated Area of Bangladesh: A Case Study. *The Journal of Interdisciplinary Environmental Studies* 11(2): 16-36.

Talukder, J., Roy, G. D. and Ahmed, M. (1992) *Living with Cyclone*. Dhaka: Community Development Library.

Tearfund (2008) *Linking Climate Change Adaptation and Disaster Risk Reduction*. London: Tearfund.

Thomalla, F. and Schmuck, H. (2004) 'We All Knew that a Cyclone Was Coming': Disaster Preparedness and the Cyclone of 1999 in Orissa, India. *Disasters* 28(4): 373–387.

Thomalla, F., Downing, T., Spanger-Springfield, E., Han, G. and Rockstrom, J. (2006) Reducing Hazard Vulnerability: Towards a Common Approach between Disaster Risk Reduction and Climate Adaptation. *Disasters* 30(1): 39–48.

Tisdell, C. (2005) *Elephants and Polity in Ancient india as Exemplified by Kautilya's Arthasastra (Science of Polity)*, Working Paper No. 120. Brisbane: The University of Queensland. Available at: http://ageconsearch.umn.edu/bitstream/55062/2/WP120.pdf.

Tobin, G. A. (1999) Sustainability and community resilience: the holy grail of hazards planning. *Environmental Hazards*, 1: 13–25.

Tobin, G.A. and Montz, B.E. (1997) *Natural Hazards: Explanation and Integration*. New York: The Guilford Press.

Torry, W. I. (1978) 'Bureaucracy, community and natural disasters'. *Human Organization* 37(3): 302–307.

Torry, W. I. (1979) 'Anthropological studies in hazardous environments: past trends and new horizons'. *Current Anthropology* 20(3): 517–540.

Trabucco, A., Zomer, R. J., Bossio, D. A., van Straaten, O. and Vercot, L. V. (2008) Climate change mitigation through afforestation/reforestation: A global analysis of hydrologic impacts with four case studies. *Agriculture, Ecosystems and Environment*, 126 (1–2): 81–97.

Tran, P. and Shaw, R. (2007) Towards an integrated approach of disaster and environmental management: A case study of Thua Thien Hue province, central Viet Nam. *Environmental Hazards*, 7: 271–282.

Twigg, J. (2004) *Disaster Risk Reduction: Mitigation and Preparedness in Development and Emergency Programming*. London: Overseas Development Institute (ODI).

Twigg, J. and Bhatt, M. R. (eds.) (1998) *Understanding Vulnerability: South Asian Perspectives*. London: Intermediate Technology Publications.

UN (United Nations) (2000) *Millennium Declaration*, New York: United Nations Press.

UN (2006) Global Survey of Early Warning Systems. Prepared by UN International Strategy for Disaster Risk for the United Nations. Geneva: UNISDR.

UN (2009) *Summary and Recommendations: 2009 Global Assessment Report on Disaster Risk Reduction – Risk and poverty in a changing climate: Invest today for a safer tomorrow*. New York: UN.

UN (2011) *Millennium Goals Report 2011*. New York: United Nations. Available at: www.un.org/millenniumgoals/pdf/%282011_E%29%20MDG%20Report%202011_Book%20LR.pdf. Accessed: 20 April 2013.

UN (2015) *Sendai Framework for Disaster risk Reduction 2015-2030*. Available at: http://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf. Accessed: 12 July 2015.

UNDP (United Nations Development Programme) (2004) *Reducing Disaster Risk: A Challenge for Development*. Geneva: UNDP, Crisis Prevention and Recovery, Disaster Reduction Unit. http://www.undp.org/bcpr/disred/ english/publications/ rdr.htm.

UNDP (2010_a) *Adaptation fund: Exploring the gender dimensions of climate finance mechanisms*. Available at: http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/climate-change/gender-adaptation-fund/Gender_Adaptation_Fund_2010.pdf.pdf. Accessed: 12 September 2015.

UNDP (2010b) *UNDP Results: Climate Change*. New York: UNDP.

UNECA (United Nations Economic Commission for Africa) (2012) *Bridging the means of implementation gaps: Key issues for Africa*. Addis Abba: UNECA.

UNESCO (United Nations Educational, Scientific and Cultural Organization) (2014) *Understanding Community Perceptions about Climate Change in the Pacific – Sharing Perceptions of Adaptation, Resilience and Climate Knowledge (SPARCK),* Final Report July 2014. Bangkok: Themma Group.

UNFCCC (United Nations Framework Convention on Climate Change) (1992) *United Nations Framework Convention on Climate Change*. http://unfccc.int/not_assigned/b/ items/1417.php.UN/ISDR.

UNFCCC (2004) *Application of methods and tools for assessing impacts and vulnerability, and developing adaptation responses*. Background paper by the UNFCCC Secretariat. Bonn: UNFCCC. FCCC/SBSTA/2004/INF.13.

UNFCCC (2006) *Technologies for Adaptation to Climate Change*. Bonn: UNFCCC.

UNFCCC (2008) *Conference of the Parties: Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007*. Bonn: UNFCCC.

UN-HABITAT (United Nations Human Settlements Programme) (2008) *State of the World's Cities 2008/2009: Harmonious Cities*. Nairobi: UN-HABITAT.

UN-HABITAT and IFRC (2010) *Shelter Projects 2009*. Available at: http://www.disasterassessment.org/documents/204800-Sheltercatalogue2009-EN.pdf. Accessed: 22 May 2013.

UNICEF Bangladesh (2011) *Education in Emergencies and Post-Crisis Transition: 2010 Report Evaluation*. Dhaka: UNICEF Bangladesh.

UNISDR (2004b) *Terms of Reference*, IATF Working Group on Climate Change and Disaster Risk Reduction. Geneva: UNISDR. http://www.unisdr.org/eng/task% 20force/tf-meetigns/10th-TF-mtg/Workdoc4-WGClimateChange-DR-tor.docS.

UNISDR (2007) *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. Extract from the final report of the World Conference on Disaster Reduction (A/CONF.206/6). Geneva: UNISDR.

UNISDR (2008a) *Briefing Note 01: Climate Change and Disaster Risk Reduction*. Geneva: UNISDR.

UNISDR (2008b) *Gender Perspectives: Integrating Disaster Risk Reduction into Climate Change Adaptation: Good Practices and Lessons Learned*. Geneva: UNISDR.

UNISDR (2009a) *2009 Global Assessment Report on Disaster Risk Reduction - Risk and Poverty in a Changing Climate: Invest Today for a Safer tomorrow*. Manama, Bahrain: Oriental Press.

UNISDR (2009b) *2009 UNISDR Terminology on Disaster Risk Reduction*. Geneva: UNISDR.

UNISDR (2009c) *Briefing Note 02: Adaptation to Climate Change Reducing Disaster Risks: Country Practices and Lessons*. Geneva: UNISDR.

UNISDR (2011) *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. Mid term review 2010-2011. Geneva: UNISDR.

UNISDR (2012) *UNISDR Annual Report 2012*. Geneva: UNISDR.

UNISDR (2013) *Synthesis Report: Consultations on a Post-2015 Framework on Disaster Risk Reduction (HFA2)*. Geneva: UNISDR.

UNISDR (2014) *UNISDR Annual Report 2014*. Geneva: UNISDR.

van Aalst, M. and Helmer, M. (2004) *Preparedness for Climate Change*. The Hague: Red Cross/Red Crescent Centre on Climate Change and Disaster Preparedness.

van Aalst, M., Maarten, K., Cannon, T. and Burton, I. (2008) Community level adaptation to climate change: The potential role of participatory community risk assessment. *Global Environmental Change*, 18: 165–179.

Vatsa, K. S. (2005) *Invest to prevent disaster: Microfinance for Disaster Risk Management in Bangladesh*, Case Study2. Geneva: UNISDR.

Venton, P. and La Trobe, S. (2008) *Linking Climate Change Adaptation and Disaster Risk Reduction*. Tweddington, UK: Tearfund.

Viner, D. and Bouwer, L.M. (2006) *Linking Climate Change Adaptation and Disaster Management for Sustainable Poverty Reduction – Vietnam Country Study*. Available at: http://www2.gtz.de/wbf/4tDx9kw63gma/Linking_Climate_Change_Disaster_Risk_Sustainable_Poverty_Reduction.pdf

Walker, P. A. (2005) Political ecology: where is the policy? *Progress in Human geography*, 30(3): 382–395.

Warner, K., Ranger, N., Surminski, S., Arnold, M., Linnneroooth-Bayer, J., Michel-Kerjan, E., Kovacs, P. and Herweijer, C. (2009) *Adaptation to Climate Change: Linking Disaster Risk Reduction and Insurance*. Geneva: UNISDR.

WARPO-Halcrow (2004) *National Water Management Plan*. Dhaka: Water Resources Planning Organization (WARPO).

Watson, R. T., Zinyoera, M. C., and Moss, R. H. (1996) *Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analysis*. Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Watts, M. J. (1983) *Silent Violence: Food, famine and peasantry in Northern Nigeria*. Berkeley, USA: University of California Press.

Watts, M. J. (1987) Drought, environment and food security: some reflections on peasants, pastoralists and commoditisation in dryland West Africa. In: Glantz, M. (ed.), *Drought and Hunger in Africa*, pp. 171–211. Cambridge: Cambridge University Press.

Webster, P. J., Holland, G. J., Curry, J. A. and Chang, H. R. (2005) Changes in tropical cyclone number, duration, and intensity in a warming environment. *Science*, 309(5742): 1844–1846.

Weichselgartner, J. (2001) Disaster mitigation: the concept of vulnerability revisited. *Disaster Prevention and Management*, 10(2): 85–94.

Werz, M. and Conley, L. (2012) *Climate Change, Migration, and Conflict: Addressing complex crisis scenarios in the 21st Century*. Washington DC: the Center for American Progress and Heinrich Böll Foundation.

WHO (World Health Organization) (2015) *Ebola Data and Statistics – Situation Summary: Data published on 06 February 2015*. Available at: http://apps.who.int/gho/data/view.ebola-sitrep.ebola-summary-20150206?lang=en. Accessed: 08 February 2015.

Wilkinson, S. (2004) Focus group research. In Silverman, D. (ed.), *Qualitative research: Theory, method, and practice.* Thousand Oaks, CA: SAGE Publications Ltd: 177–199.

Williams, G. (2004) Evaluating participatory development: Tyranny, power, and (re)politicization. *Third World Quarterly*, 25(3): 557–578.

Wisner, B., Blaikie, P., Cannon, T. and Davis, I. (2004) *At Risk: Natural Hazards, People's Vulnerability and Disasters*. 2nd edn. Reprint, London & New York: Routledge, 2008.

Wisner, B. and Walker, P. (2005) Beyond Kobe: An Interpretative Report on the World Conference on Disaster Reduction, Kobe, Japan, 18–22 January 2005. http://online.northumbria.ac.uk/geography_research/radix/resources/beyond_kobe_for_websites_july2005.pdf.

Wong, S. (2010) *Elite Capture or Capture Elite? Lessons from the 'Counter-elite' and 'Co-opt-elite' Approaches in Bangladesh and Ghana*. United Nations University – World Institute for Development Economics Research (UNU-WIDER) Working Paper No. 2010/82. Helsinki: UNU-WIDER.

World Bank (2010) Economics of Adaptation to Climate Change [online]. Available at: http://climatechange.worldbank.org/sites/default/files/documents/EACC_Bangladesh.pdf. [Accessed: 20 March 2015]

Wynne, B. (1994) Scientific knowledge and the global environment. In Redclift, M. and Benton, T (eds). *Social Theory and the Global Environment.* London: Routledge: 169-189.

Wynne, B. (1996) May the Sheep safely graze? A reflexive view of the expert-lay knowledge divide. In Lash, S., Szerszynski, B. and Wynne, B. (eds). *Risk, Environment and Modernity.* London: Sage: 44 – 83.

Yohe, G. and Tol, R. (2002) Indicators for social and economic coping capacity: moving toward a working definition of adaptive capacity. *Global Environmental Change*, 12: 25–40.

Yohe, G., Strzepek, K., Pau, T. and Yohe, C. (2003) Assessing Vulnerability in the context of changing socioeconomic conditions: A study of Egypt. In Smith, J. B., Klein, R. J. T. and Huq, S. (eds.), *Climate Change, Adaptive Capacity and Development*. London: Imperial College Press.

Young, L. and Barrett, H. (2001) Adapting visual methods: action research with Kampala street children. *Area*, 33(2): 141–152.

Zakaria, A. K. M. and Akhter, R. (2010) *Challenges and Opportunities of Women Entrepreneurship in Seed Sector*. Bogra, Bangladesh: Rural Development Academy.

Zebrowski, C. (2013) "The Nature of Resilience", *Resilience*, 1(3): 159–173.

Ziervogel, G. and Zermoglio, F. (2009) Climate-change scenarios and the development of adaptation strategies in Africa: Challenges and opportunities. *Climate Research*, 40(2-3): 133–146.

Zomer, R. J., Trabucco, A., Bossio, D. A. and Vercot, L. V. (2008) Climate change mitigation: A spatial analysis of global land suitability for clean development mechanisms afforestation and reforestation. *Agriculture, Ecosystems and Environment*, 126 (1–2): 67–80.

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